

BRITISH FERNS



M^{RS}. LAYKESTER



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BRITISH FERNS



TRUE MAIDENHAIR.

BRITISH FERNS

THEIR CLASSIFICATION, STRUCTURE
AND FUNCTIONS

TOGETHER WITH

THE BEST METHODS FOR THEIR CULTIVATION

BY

MRS. LANKESTER

AUTHOR OF "WILD FLOWERS WORTH NOTICE"

New Edition

WITH COLOURED FIGURES OF ALL THE SPECIES

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BRITISH FERNS.



INTRODUCTION.

THIS work is intended as a guide to the lover of Nature, who, though not perhaps scientifically acquainted with botany, may partake of the desire, so natural in all minds, to possess, in the best way circumstances will allow, some shadow of the green country lanes and lovely scenes, so refreshing even in the remembrance. Ferns may be successfully cultivated either in a conservatory, a Wardian case, or the open air. To accomplish this, and even to bring something of the verdure of a country lane into the close atmosphere of the city, by means of a closed or Wardian case, in which not only ferns but also some other plants will live and thrive, is perfectly easy. Mr. Ward, the ingenious inventor, succeeded in cultivating many flowers—such as fairy roses, and even the most luxuriant tropical plants, in them. But it must be remembered that the chief object in these

closed cases is to secure a moist atmosphere, and freedom from the all-pervading dirt and dust of cities. To many plants the moisture thus secured is injurious, but to nearly all ferns it is peculiarly grateful, and to them, therefore, especially, this mode of culture is chiefly applicable. In Mr. Ward's own book on the subject, he speaks of what may be done to imitate nature in the growth of ferns; how bits of natural scenery may be artificially built up, with water trickling down from elevated portions of rock, and flowing out of the fern-house in one continuous stream. In such a house each fern would find its natural position, and attain a luxuriance astonishing to those who have never tried the experiment. "Each fern could be supplied with a proper base of earth or rock, and each could have the amount of light most suited to its fullest development." Mr. Ward goes on even to suggest what he himself so beautifully carried out—the culture and growth of majestic tropical forms of vegetation under glass covering, such as may easily be constructed in a London yard. Tree-ferns, palms, and the numberless variety of mosses and ferns brought from distant regions, would here flourish in their native perfection. To begin, however, with something much less ambitious, we will suppose that we are visiting some rural district in England—Devonshire, or the Isle of Wight—where the lanes and coppices are luxuriant with the bright green fronds of familiar ferns. With a trowel or some other instru-

ment, we dig round the roots, and deeply down, so as not to injure them ; and removing each specimen with a good portion of its natural soil, we consign them to our vasculum, until, returning to our town home, we think of establishing our fern-case. The elegance of this may vary, according to our means or our pleasure the humblest form being, as far as we know, as successful, according to its size, as the most elaborate. The first thing in any case is to secure good drainage, by one or more holes at the bottom of the case ; be it either a large earthen flower-saucer, a soup-plate, or a zinc constructed case. Broken flower-pots, cinders, bits of sandstone, and then a compound of peat-earth and silver sand, should fill these pans or cases, and porous bits of stone forming artificial rocks may be built up and around the ferns when they are planted. On these rocks, mosses and lycopodiums will grow and thrive. For the covering of the commonest kind of case, obtain a bell-glass just large enough to fit tightly round the edge of the pan, so as to exclude the external air. This may be removed occasionally, and the fronds sprinkled with water, but not too often ; and, as far as possible, the glass should be kept bright and clear. The soil, before being used, should be carefully sifted, to prevent any worms or insect eggs being admitted with it. Any appearance of blight may be treated with lime-water.

The case itself should not be placed in too retired a part of the room (except as regards that containing

Trichomanes brevisetum, or *Hymenophyllum*), as the natural tendency of the plants to creep towards the light would thereby be increased. An important point in the success of a fern-case is the removal of dead or decaying portions, as they soon spread, and produce disease in the whole case.

It will be found that all species of ferns will not grow well together, requiring, as they do, in some cases different treatment. A case may be specially devoted to shade-loving ferns, such as *Hymenophyllum* and *Trichomanes*, and sheltered from the light by a gauze covering, or coloured glass; but this is best learned by studying the natural habits of each individual species, and as far as possible imitating their accustomed conditions.

To those who are fortunate enough to live away from the smoke and noise of great cities, an open air fernery will afford much delight. To such we would say, choose a sheltered and shady situation—if under the defence of a wall the better—and one looking north or west. Make up your raised bed with a light soil, largely intermixed with frequent rough porous stones. Front it with rock-work, wherein to fix, especially, the smaller and wall kinds; the larger and more feathery being of course placed behind in the bed itself. Set them not in too closely together, and remember that those having creeping roots will often extend themselves, and reappear in adjacent spots. If the ground slopes too much, many are inclined to

slide downward into the lower positions. Water before planting, and from time to time as needed; but let there be opportunity of drainage, so that the bed never becomes marshy or sour; as, though *Osmunda* and *Aspidium Thelypteris* like this, and some few others, as *Blechnum*, *Aspidium spinulosum* and *dilatatum*, can endure it, to the majority it would be injurious, if not fatal. Should the heat of summer be too great, and shrivel up any of the tender plants, they may be restored, and kept in order by duly watering at night. The wild plants may be removed at any season of the year, though the autumn is the fittest. In the winter many will have died down, till hardly discernible, except to a practised eye. A fresh addition of peat, or leaf-mould, seems to be the only manure yet recommended. The more delicate sorts may, perhaps, be well covered in from the frost by straw or heaps of leaves. It may here be mentioned, that the vicinity of water is a favourable position for a fernery, and where such does not naturally exist it may well be introduced, either as a small basin or rivulet, the border of which will afford the means of growing a great many curious subaquatic and bog plants, and the projections will be excellent positions for *Osmunda*, Water-lilies occupying the centre.

In a volume written by Mr. John A. Smith, Ex-Curator of the Royal Gardens at Kew, called 'Ferns British and Foreign,'* we have not only excellent

* London: David Bogue, 3 St. Martin's Place, W.C. Price 7s. 6d

descriptions of species, but ample directions as to their various modes of cultivation.

Another method of preserving ferns is in the herbarium; and of all plants they seem best to stand the process of drying, and to lose less of their original colour and beauty of form than any others.

To those who have not already made dried botanical collections, we would give the following simple directions for their guidance.



Before you leave home, procure one of the Botanist's Portable Collecting Presses, which have been specially prepared by Mr. Bogue* for the use of collectors, and which will be found admirably suited for the purpose. These presses consist of a pair

of boards, between which is a book of botanical drying paper. By means of the straps a uniform pressure may be readily obtained. They may be had in three sizes, price 7s. 6d., 8s. 6d., and 10s. 6d. each. In gathering the ferns, cut them as low down the stem as possible, and in small specimens get up the radix if you can. In putting them to dry in the blotting-paper, have respect to the natural position of the fern, and also to the size of the sheet of paper on which they are to be finally placed. When the fronds are

* 3 St. Martin's Place, W.C.

long, or the specimen large, they may be bent so as to lie in a smaller space than they otherwise could ; and if dried in a certain position, will retain the form easily. It is best at first to make the pressure lightly, so as to alter the form of the plant if needful before it is completely dried, then increase the pressure day by day until the specimens are ready to remove. Ferns dry quickly and easily, and may, without injury, be kept in the drying-paper for some time. When, however, they are removed to put down finally, they should be secured by little thin strips of gummed paper, which is best prepared beforehand by covering a sheet of note-paper with a strong solution of gum, which, when dry, may be kept for a long time ready for use. The thinner the slips are cut the better, so as to hold the parts of the plant in their right position. This plan is preferable to gumming the whole plant, or portions of it, as the little slips can at any time be removed with a penknife without injuring the paper or book in which they are fixed, should there be occasion to remove the specimen. In drying your ferns, be careful to change the blotting-paper two or three times a week, so as to remove any dampness, and dry your paper in the sun or before the fire very often. It is best to have two sets of paper, so that one can be dried while the other is in use. Any ordinary fern will be fit to put into the folio in two or three weeks at most.

In describing the forms of British ferns in this

book, we have followed the arrangement and names given by Sir William Hooker in the most recent edition of his 'British Ferns.'

The synonyms given to each species are intended as a guide to those who wish to read further about the plant, and refer to the names under which it may be found in the works of our chief botanists; otherwise there would often be difficulty in recognising the same species under another name.

CLASSIFICATION OF FERNS.

IN order that the student may have an idea of the general structure of the class of plants known as Ferns or Filices, we present an analysis of the characters of the orders and genera into which they are divided by botanists. It must always be remembered, that the species of British ferns are only a small part of the great family of ferns which are scattered *in space* over the surface of the earth, and *in time* in the rocks of which the earth is composed. Geology reveals to us that coal—that source of our domestic comfort and national greatness—is formed chiefly of ferns which at some remote period grew upon the earth; and fossil remains show that contemporaneously with ferns, grew plants of remarkable character, quite different from those of the present era. Not so with ferns, for their beautiful and well-preserved remains indicate species almost identical with many now living and growing amongst us here and in far-off portions of the world. No arrangement of fragmentary groups, such as the British ferns, can give the student an idea of the grandeur, beauty, and harmony of the whole.

But the study of this limited portion of the great family, will, it is hoped, kindle in him a desire to know more of this great family, which, though deprived of the beauty and adornment of flowers, have nevertheless attractions and graces of their own, and, with all other created things, the charm of occupying a necessary place in the great order of creation.

ARRANGEMENT OF THE GENERA OF BRITISH FERNS.

POLYPODIACEÆ.

The fronds are rolled up in a circinate manner while young, the spore-cases have an elastic ring, which bursts by an irregular transverse cleft.

I. POLYPODIACEÆ.

Sori *round*, without an indusium.

1. POLYPODIUM.—The sori dorsal, circular, and exposed.

2. ALLOSORUS.—Sori dorsal, roundish, and becoming confluent beneath the margins of the frond.

II. GYMNOGRAMMÆ.

Sori *linear*, without an indusium.

3. GYMNOGRAMMA.—Sori dorsal, linear, forked, naked.

III. ASPIDIEÆ.

Sori covered with a *circular* or *roundish* indusium, springing from the *back* of the veins.

4. ASPIDIUM.—Sori dorsal, with circular, peltate, or reniform indusia.

NEPHRODIUM.—Sori round, with reniform indusium.

IV. ASPLENIEÆ.

Sori covered with an *oblong* or *elongated* indusium which springs from the sides of the veins.

5. ASPLENIUM.—Sori dorsal, with a *straight* and *elongated* indusium.

6. SCOLOPENDRIUM.—Sori dorsal, *elongate*, and placed together in parallel pairs, the indusium opening along the centre.

7. CETERACH.—Sori dorsal, hidden amongst rust-coloured chaffy scales; the indusium invisible.

V. BLECHNEÆ.

The sori with an indusium forming *longitudinal lines* between the mid-rib and margins of the pinnæ.

8. BLECHNUM.—Sori dorsal, covered by a linear indusium.

VI. PTERIDEÆ.

Bearing, on the *margins* of fronds, sori, which are covered with a special indusium.

PTERIS.—Sori in a continuous line at the *edge of the frond*.

VII. ADIANTEÆ.

The margins of the fronds *reflexed*, forming indusia, which bear the sori beneath.

9. ADIANTUM.—Sori dorsal, in patches, covered with a *reflexed* indusium.

VIII. CYSTOPTERIDEÆ.

Sori with special *ovate* indusia attached behind, and inflected *hood-like* over them.

10. CYSTOPTERIS.—Sori dorsal, with a *cucullate* or *hood-like* indusium.

IX. WOODSIEÆ.

Sori having a *roundish* indusium springing from the *back* of the *veins*.

11. WOODSIA.—Sori dorsal, with an indusium attached beneath them.

X. HYMENOPHYLLÆ.

Sori produced at the *end of the veins*, and projecting from the margin, and surrounded by *urn-shaped* and 2-valved membranes.

12. TRICHOMANES.—Sori marginal, covered by *urn-shaped* expansions of the frond.

13. HYMENOPHYLLUM.—Sori marginal, surrounded by 2-valved expansions of the frond.

OSMUNDACEÆ.

Fronds circinate, sori destitute of an elastic ring, and bursting vertically by two regular valves.

14. OSMUNDA.—The only genus.

OPHIOGLOSSACEÆ.

Young fronds folded up straight, the sori without an elastic ring, and 2-valved.

15. BOTRYCHIUM.—Sori in *irregularly branched clusters* on a separate branch of the frond.

16. OPHIOGLOSSUM.—Sori sessile, in *2-ranked simple spikes* on a separate frond.

In order to facilitate finding the name of a fern, we add the following analytical index, for the general plan of which we are indebted to Bentham's admirable 'Handbook of the British Flora.'

- | | | |
|---|---|---|
| 1 | { | Fructification in a terminal spike or panicle. The frond either leaf-like, or bearing a leaf in the lower part 2 |
| | | Fructification in a little cup or involucre at the edge of the frond 4 |
| | | Fructification on the back or under side of some or all the fronds 5 |
| 2 | { | Fronds twice-pinnate, usually two or more feet high, the fructification forming a panicle at their extremity .. OSMUNDA. |
| | | Fronds stem-like, not 6 inches high, with a terminal spike or panicle 3 |
| 3 | { | Spike simple. Leaf entire OPHIOGLOSSUM. |
| | | Spike branched into a panicle. Leaf pinnate. BOTRYCHIUM. |
| 4 | { | Fronds numerous, scarcely 2 inches high, pinnate with few deeply lobed segments. Involucre ovate, 2-lobed. HYMENOPHYLLUM. |
| | | Fronds 6 or 8 inches high, two or three times pinnate, with crowded segments. Involucre cup-shaped. TRICHOMANES. |
| 5 | { | Fronds tufted, of two sorts, the centre ones erect, fruiting, the outer ones barren, usually shorter, with broader lobes .. 6 |
| | | Fruiting and barren fronds similar, or nearly so 8 |

- 6 { Fronds (stiff) simply pinnate, with entire lobes, the fruiting linear, the barren lanceolate BLECHNUM.
 Fronds (delicate) much divided, with small, obovate or oblong toothed lobes.. .. . 7
- 7 { Sori forming a line close to the margin of the frond. ALLOSORUS.
 Sori oblong, scattered on the surface of the frond. GYMNOGRAMMA.
- 8 { Fructification concealed by, or intermixed with, chaffy scales or hairs 9
 Fructification in lines along the margin of the fronds, the indusium a membrane attached to the margin 10
 Fructification in circular, oblong, or linear sori, on the under surface, without chaffy scales 11
- 9 { Fronds deeply pinnatifid, with entire segments. Sori linear, concealed by the scales 10. CETERACH
 Fronds twice-pinnate, with small segments. Sori circular, with chaffy hairs intermixed 15. WOODSIA.
- 10 { Tall, erect, stiff fern, ternately divided, with pinnate branches and sessile lobes PTERIS.
 Delicate fern, not a foot high, much divided, with broad wedge-shaped lobes on capillary stalks ADIANTUM.
- 11 { Sori oblong or linear, covered (when young) with a membrane attached along the side 12
 Sori circular, either without any indusium, or covered (when young) with a membrane attached by the centre or by a lateral point 13
- 12 { Frond entire. Indusium opening in a slit along the centre. SCOLOPENDRIUM.
 Frond pinnate or much divided. Indusium opening along the inner side ASPLENIUM.
- 13 { Fronds simply pinnate, with entire or toothed segments or pinnae 14
 Fronds pinnate, with pinnatifid primary divisions or pinnae, or twice or thrice pinnate* 15

* In all twice or thrice pinnate leaves or fronds, the primary divisions on each side of the main stalk are called *pinnae*, the ultimate divisions retaining the name of *segments*.

- 14 { Segments narrow-lanceolate, rather thick, attached to the stalk by a broad base, and confluent. Sori golden-yellow, without any indusium POLYPODIUM VULGARE.
Segments distinct or stalked, ovate-falcate, prickly-toothed, with a prominent angle or lobe at the base on the inner side. Sori with a small circular indusium .. . ASPIDIUM LONCHITIS.
Segments small, obovate. Stalk black and slender. Indusium attached laterally ASPLENIUM TRICHOMANES.
- 15 { Lower pair of pinnas much larger than the others, giving the frond a broadly triangular or rhomboidal form 16
Lowest pair, or several lower pairs of pinnas, decreasing in size, or not larger than the rest. Frond ovate or lanceolate in outline 17
- 16 { Fronds once-pinnate, with pinnatifid segments.
POLYPODIUM PHEGopteris.
Fronds twice-pinnate, the pinnas mostly opposite.
POLYPODIUM DRYopteris.
Fronds twice-pinnate, the pinnas mostly alternate.
CYSTopteris.
- 17 { Fronds delicate, seldom a foot high, without any brown scarious scales (or very few at the base of the stalk), twice-pinnate, with stalked pinnas 18
Fronds stiff, 1 to 3 feet high or more (except in the *Beech Polypody*). The stalk more or less shaggy below the leafy part, with brown scarious scales (except in the *Marsh Shield Fern*) 19
- 18 { Segments with fine-pointed teeth ASPLENIUM.
Segments oblong or lanceolate, nearly sessile, with obtuse teeth or lobes CYSTopteris.
Segments small, obovate, stalked, with obtuse teeth. Delicate annual GYMNogramma.
- 19 { Fronds pinnate, the pinnas deeply pinnatifid, the lobes entire or obtuse, and slightly toothed 20
Fronds twice-pinnate, the segments sharply toothed or pinnatifid 24
- 20 { Pinnas (all but the lowest pair) attached to the stalk by their broad base POLYPODIUM PHEGopteris.
Pinnas attached by their midrib only 21

- | | | |
|----|---|---|
| 21 | { | Lobes of the pinnas entire. Sori near their margins 22 |
| | | Lobes of the sori slightly toothed. Sori near their base or centre 23 |
| 22 | { | No scarious scales on the stalk. No glands on the leafy part. ASPIDIUM THELYPTERIS. |
| | | Stalk with brown scarious scales at the base. Minute glands on the under surface of the segments. ASPIDIUM OREOPTERIS. |
| 23 | { | Segments of the pinnas oblong, very numerous, scarcely broader at the base ASPIDIUM FILIX MAS. |
| | | Segments ovate, wedge-shaped at the base. ASPIDIUM CRISTATUM. |
| 24 | { | Segments of the pinnas with finely pointed, almost prickly teeth; the inner lobe or tooth at the base much larger than the rest ASPIDIUM ACULEATUM. |
| | | Segment of the pinnas with shortly pointed teeth or pinnatifid; the lobes of each side similar 25 |
| 25 | { | Sori circular. No indusium POLYPODIUM ALPESTRE. |
| | | Sori circular, with a kidney-shaped or almost peltate indusium attached by a point 26 |
| | | Sori rather oblong, with an indusium attached along one side ASPLENIUM. |
| 26 | { | Segments ovate or ovate-lanceolate. Indusia conspicuous and persistent ASPIDIUM CRISTATUM. |
| | | Segments oblong-lanceolate 27 |
| 27 | { | Indusia conspicuous and persistent .. ASPIDIUM RIGIDUM. |
| | | Indusia small and often soon disappearing. ASPIDIUM SPINULOSUM. |

The way in which this index is used is as follows: Suppose we have the Common Hart's-tongue, *Scolopendrium vulgare*, in our hands; we look to the paragraph numbered I, and here we have three forms of fructification mentioned. The form to which the *Scolopendrium* belongs is "Fructification on the back or under side." Opposite this is the figure 5. This is to direct us to paragraph 5. Here we find two

characters of the fronds noted. Our *Scolopendrium* belongs to the division in which the "fruiting and barren fronds are similar, or nearly so," and opposite this is the number 8. We now turn to paragraph 8, and here we have again three other forms of fructification; and we find the fern in our hands belongs to the division in which the sori are linear, oblong, or circular on the under surface, without chaffy scales; and against this character we have the number 11. We now turn to paragraph 11, and here the sori are again distinguished into two groups—those which are oblong or linear, and those which are circular. The *Scolopendrium* has oblong or linear sori, and against this is the number 12. Now paragraph 12 has two distinctions, one of which is "fronds pinnate," the other "fronds entire"; and opposite this is the name *Scolopendrium*. The plant, then, we have in our hand is the Common Hart's-tongue. In the same way we may find out any other genus or species in the index.

As the genus *Asplenium* contains so many species, Bentham gives a separate analysis of them, which we also subjoin here.

Fronds twice or thrice pinnate, with numerous primary pinnae, the lowest or several lower pairs decreasing in size.

Frond 2 or 3 feet high, the longer pinnae 3 to 6 inches or more.

ASPENIUM FILIX-FÆMINA.

Frond not a foot high, the longer pinnae seldom 1½ inches.

Broadest part of the frond above the middle. Ultimate segments

1 to 1½ lines long ASPENIUM FONTANUM.

Broadest part below the middle. Ultimate segments broad, 2 to

3 lines long ASPENIUM LANCEOLATUM.

Fronde once-pinnate, with numerous segments, the lower pairs decreasing in size.

Segments thick, ovate or lanceolate, $\frac{1}{2}$ to 1 inch long or more.

ASPLENIUM MARINUM.

Segments thin, ovate or orbicular, under 5 lines long.

ASPLENIUM TRICHOMANES.

Fronde more or less divided, the lowest pinnae larger, on longer stalks, or more divided than the others.

Fronde 6 inches to a foot, shining green, with numerous lanceolate pinnae and sessile segments.

ASPLENIUM ADIANTUM NIGRUM.

Fronde 3 or 4 inches, with few small, stalked segments.

Segments obovate ASPLENIUM RUTA-MURARIA.

Segments narrow-oblong ASPLENIUM GERMANICUM.

Segments linear ASPLENIUM SEPTENTRIONALE.

THE STRUCTURE AND FUNCTIONS OF FERNS.

THE Vegetable Kingdom is divided into two great groups of plants—those with flowers and those without—technically, *Phanerogamia* and *Cryptogamia*. The ferns belong to the latter group. They are easily distinguished from the mosses, horsetails, fungi, lichens, and algæ, with which they are associated, by their large size and leafy character. The part of the fern which, from its green colour and general form, resembles a leaf, is called a frond. Although ferns have no proper flowers, they have organs which perform the functions of flowers in higher plants. These organs are seldom seated on a separate stem or stalk, but are placed on the edges and under side of the fronds.

Ferns, like other plants, have roots and stems. The roots of ferns are composed of small fibres, which are sent down from the stem, and they perform the same functions in ferns as in other plants. They serve to keep the plant in the soil in which it grows, and are also endowed with the property of absorbing from

the soil the food which the plant requires for its nutrition.

The stem of a fern consists of a mass of tissue, from which the stalks of the fronds proceed upward, and the root downward. In British ferns, these stems seldom rise up into the air, but are either buried in the earth, or lie prostrate upon it: in the common polypody and the spleenwort they attain a considerable size. When out of the ground, they are covered with scales and hairs, and present a very shaggy appearance. In some cases, as in the Common Brakes and the Flowering Fern, the stem rises erect in the air, and bears its fronds in the same way as higher plants bear their leaves. It is in tropical ferns that these stems attain their greatest size, and rise above the ground forty or fifty feet in height. Such ferns are called tree-ferns. But the nature of this stem is the same in all cases: it consists of a mixture of woody and cellular tissue, constituting the basis of the fronds; and in cases where the stem is perennial, it consists of the remains of the successive annual developments of the fronds.

The fronds vary much in form, and the stalk on which they are placed is called the stipes. They vary in size, and also in duration: they usually, however, come up in the spring, and lie down in the autumn.

The frond, like the leaf, is divided into the blade and stalk, or stipes. The woody tissue of which

the stipes is formed is continued into the blade, and constitutes there the veins or ribs. The middle portion which runs up the whole frond, is called the mid-rib.

The same terms are applied to the shape of the frond as to the leaf. When the blade is undivided, as in the Hart's-tongue, it is called *entire*; when the frond is scalloped out, and the indentations do not reach the midrib, the frond is said to be *pinnatifid*; when the indentations reach the midrib, and leave a series of little leaflets, or *pinnæ*, the frond is said to be pinnated. The *pinnæ* may be again divided down to their veins or ribs, and the frond is then said to be twice-cut or *bi-pinnate*. When this occurs a third time, it is *tri-pinnate*; and when oftener, the frond is said to be *decompound*. This latter does not, however, often occur in British species. The more vigorous specimens of the Common Brakes occasionally present it.

When the fronds are first formed in the bud, they are rolled up in a peculiar way. The whole frond is rolled up from the point to the base, upon itself; and when it is divided into *pinnæ*, each *pinna* is rolled in the same way upon itself. This arrangement occurs in other plants, and is called *circinate*. All British ferns, with the exception of the Adder's-tongue and Moonwort, have this circinate arrangement of their fronds.

The *veins* or *ribs* of the fronds are variously arranged,

forming sometimes good characters for the distinction of species. These veins are never *netted*, as they are in the majority of flowering plants, but they are often forked, or dichotomous. It is upon the veins of the under part of the frond that the organs of fructification are placed; and this part is called the *receptacle*.

The organs of fructification consist of a number of little capsules, called seed-cases, spore-cases, sporangia, or thecæ. These are collected together in little clusters, which are called *sori*. The sori are placed upon the receptacle. When the sori are placed on the under part of the frond, they are called *dorsal*; but when on the edge of the frond, *marginal*. They are never placed on the upper surface of the frond alone. Sometimes the whole frond is converted into a receptacle, as in the case of the Flowering Fern, the Adder's-tongue, and some others.

The *spore-cases* are mostly small, slightly ovate bodies, with a single cavity. They are surrounded with a *ring*, one end of which is fixed to the receptacle. When the spores contained in the inside have reached maturity, the elasticity of the ring causes the spore-case to burst transversely, and the spores are scattered about in the form of fine dust. In *Osmunda*, *Botrychium*, and *Ophioglossum*, the spore-cases have not the elastic ring, but are composed of two valves.

In the greater part of the British species, the sori are covered during the earlier period of their growth with a thin membranous covering, which is called an *indusium*. Some ferns possess this organ, which is very evident when they are young. It is, however, cast off as the sori attain maturity. The presence or absence of this indusium is looked upon as an important point in the economy of ferns, and they are divided according to this fact.

Although the *spore* is often called the representative of the seed, this little structureless body truly represents the bud in higher plants. If we watch the development of the spore, we shall find that it does not directly grow up into a fern, but that, after having attached itself to a damp piece of earth or rock, it begins to expand into the form of a green membrane. This green membranous mass, on account of its resemblance to the fronds of the common *Marchantia*, has been called the Marchantia-like expansion of the fern. It is also called the *prothallus*. On the surface of this little body, there appear in the course of time two sets of organs. The one called *pistillidia*, containing in their interior little ovoid bodies, which are the representatives of the ovules or seed-buds of the higher plants. The other organs are called *archegonia*: they contain little movable worm-like bodies, called *spermatazoids*, and which are found in many of the lower forms of plants. These bodies

represent the pollen or pollen-tube of the flowering plants. They find their way to the ovules contained in the pistillidia ; and it is after the mixture of the produce of these two different cells that the young fern shoots forth from the surface of the prothallus, and grows up into a new plant.

TRUE MAIDEN HAIR.

ADIANTUM CAPILLUS VENERIS,

Linnæus and all other Writers.

(Plate I.)

THIS is the only British species of the genus, and is easily recognised by its fan-shaped leaflets, and the little wiry black stalks which support them, so thin and hair-like as to have given rise to its specific name. It grows from nine to fifteen inches high, in circular masses, and is of a light bright green colour and very ornamental in appearance. Its slender creeping rhizome is shaggy, with black hair-like scales, and the base of the stipes is of a rich red-brown colour. The pinnules are very irregular in shape, but mostly wedge-shaped, or tapering at the base, with rounded or egg-shaped apex; and they have generally some variation of a fan-shaped outline. The veins in all the pinnules are two-branched or forked from the base, and extend in straight lines to the margins, where, in the barren fronds, they end in the marginal notches, but in the fertile fronds extend into the indusium, and form receptacles for the spore-cases. The sori are very small, and chiefly seated on the under part of the lobes of the higher pinnules, which thus form a membranous indusium for the development of the clusters of fructification.

This beautiful little fern is evidently a wanderer from warmer climates, and is only very locally distributed in Great Britain. Cornwall, Devonshire, and the western and southern parts of Ireland are its chief resorts. It is found only in moist caves, or the fissures of rocks, most frequently near the sea-coast, where the water trickles over its roots, or where it is exposed to the sea spray. It is found in abundance at Ilfracombe, and in many places on the south coast of Devonshire. Mr. Henry Newman, in a letter, describes his discovery of this shade-loving beauty, in its retreat in Wales, growing out of a rock encrusted with a soft deposit of carbonate of lime left by a trickling stream and looking very much like cream cheese. The spot is very near the lodge gate of the Dunraven estate.

There are three varieties of this fern, so distinct as to be considered as species by some writers. The first is a stronger, coarser, more robust plant than the others, with thicker stalks and larger fronds; the stipes has also a peculiar purple bloom. The second is the true normal form, our present species, the *Adiantum Capillus Veneris* of Linnæus. The third is a looser, less compact variety, with the stalks of the pinnules set on at acute angles, and the pinnules more deeply divided. It is not so common as the other forms.

From the earliest times the fronds of this fern have had a reputation as a remedy in pulmonary diseases,

on account of the mucilage they contain. John Ray cites the Maiden Hair as a cure for innumerable maladies when used in decoction, by pouring boiling water on the fronds. Like other ferns, it is slightly astringent, and imparts a bitter taste to the water, and has also a smooth mucilaginous property, which may account for its supposed virtues. As in the case of many other vaunted remedies, faith and belief in its power doubtless made up for all its real deficiencies as a curative agent.

The Canadian species of Maiden Hair was introduced into this country by John Tradescant, and it grows in such profusion in its native district, that it is frequently used as a package for goods. The French chemists use this species extensively in the manufacture of *capillaire*, a sweet syrup, which is sold very largely both in Paris and London. The true Maiden Hair is employed chiefly in England for this purpose, and is a safer plant than the Canadian one, which acts as an emetic when taken in any quantity. Dr. Ball, of Dublin, says that the inhabitants of Arran, where the Maiden Hair grows plentifully, employ it as a substitute for tea.

The Maiden Hair is a beautiful fern in cultivation; it grows freely in a green-house, without any artificial heat beyond what is afforded by the protection of glass. It should never be exposed to the direct rays of the sun. In Wardian cases it is eminently successful, if its natural requirements be attended to, and,

under favourable circumstances, no fern can rival it in delicacy and brilliancy of foliage. Dr. Ball pointed out to Mr. Newman a curious property possessed by this fern when growing in a Ward's case, without communication with the external air. The sori under these conditions will vegetate *in situ*, and the young plants take root like parasites in the substance of the old one.

The soil in which the Maiden Hair is best grown is a mixture of loam, leaf-mould, and silver sand, mixed with small pieces of sandstone or freestone. Mr. Johnson directs that the pots in which it is placed should be plunged in shallow pans of water, and the decayed fronds removed from time to time. It looks very pretty in a hanging basket or cocoa-nut shell, or growing between two large shells of the Pecten kind, filled with soil and moss, and suspended by wire, in the inside of a conservatory or Ward's case. The fronds resist water, or are so smooth that it always runs from them; so that Pliny says, "In vain you plunge it in water, you cannot wet it." This peculiarity appears to have suggested its name from *adiantos*, dry.

PLATE II.

1. PARSLEY FERN (*Allosorus crispus*). See Page 29.
2. COMMON PRICKLY SHIELD FERN (*Aspidium aculeatum*). See Page 30.
3. HOLLY FERN (*Aspidium Lonchitis*). See Page 33.



1. PARSLEY FERN.

2. COMMON PRICKLY SHIELD FERN.

3 HOLLY FERN.

CURLED ALLOSORUS, OR PARSLEY FERN.

ALLOSORUS CRISPUS,

Bernhardi, Babington, Moore, Newman, Bentham.

(Plate II. Fig. 1.)

SYNONYMS.

<i>Pteris crispa</i> , Linnæus, Smith		<i>Cryptogramma crispa</i> , Brown,
(Rock Brakes).		Hooker, Arnott.
		<i>Osmunda crispa</i> , Linnæus.

THIS elegant little fern might at first sight be mistaken for a tuft of parsley: it is as bright and green as that herb in the early summer. The fronds average about six inches in height, and are of two kinds. The barren fronds have broad, flat, and leaf-like segments, and are two or three times pinnate. The fertile fronds are known by their oblong or linear segments. They are nearly triangular, and the indusium is covered by the reflexed end of the frond. The veins are alternate, often forked, and each branch ending in a cluster, having no indusium, but concealed by the reflexed edge of the leaflet. The stem is slender and very brittle. The duration of this most beautiful little fern is very short; it does not reach maturity until June, and becomes disfigured by the first morning frosts of autumn.

It is confined exclusively to Europe, and in Great Britain is rather a local than a rare fern. It is unknown in the south and middle of England, and appears only in the north-west and north, also in Scotland and Ireland. Its favourite place of growth

is among rugged masses of stones and broken rocks which lie at the base or slopes of mountains in the north of England, and in Wales. On the rocks of Snowdon it may be seen covering the otherwise bare surface, and growing luxuriantly in the clefts and ledges of the slate and trap masses which there abound. In Scotland it is abundant; and it is to be found in Ireland, though more sparingly. In cultivation, this charming little fern succeeds well. Nothing can be better adapted by natural habit to the rock-work and masses of dark granite or basaltic rock, on which it should be placed in the fernery. In a closed case it also does well, if protected from the direct heat of the sun, and supplied with fragments of stone, or mortar, or bits of slate. A peaty-bog earth is the best soil for it; and, as in the case of all other ferns, its natural circumstances should be as much as possible regarded in its artificial treatment.

COMMON PRICKLY SHIELD FERN.

ASPIDIUM ACULEATUM,

(WILDENOW'S FERN)

Swartz, Smith, Hooker, Bentham, Arnott.

(Plate II. Fig. 2.)

SYNONYMS.

Polystichum aculeatum, Babington, Moore, Newman, Roth, and others.
Polypodium, Linnæus.

THIS species is almost evergreen in a sheltered situation. It is a stout plant, having tufted fronds, rising

from a short thick stem or crown from one to two feet high. Their form is lanceolate, twice-pinnate; the texture harsh and rigid; the upper surface dark green and shining; and the stalk or stipes, below the leafy part, from one to six inches long, very shaggy with brown scarious scales. The veins are alternately branched, and do not join together, but extend free to the margin. There is nothing remarkable in the fructification, which is generally abundant, beyond the regularity of arrangement in the sori, which lie in lines on each side of the mid-rib of the upper leaflets. The root is large and woody.

The European range of this fern extends to every country excepting Spain, where it has never yet been found. It is very commonly distributed throughout the United Kingdom, and is abundant on hedgerows, and in shady places in England. It seems to delight in cultivated districts, and is seldom found on open heaths or downs. This fern is easily managed in cultivation and bears exposure pretty well. It requires good drainage, and a fair allowance of sand and peat, and thus treated it forms a satisfactory member of the fernery.

The young fronds make their appearance in April, and attain their full expansion in July, while in August they are loaded with dark masses of fructification. They retain their green colour throughout the year, and the old fronds of one year may be seen contrasting with the delicate green of the young ones as they develop.

VARIETIES.

ASPIDIUM ACULEATUM LOBATUM chiefly differs in the narrow outline of the frond, which is simply pinnate. The pinnules are more decidedly decurrent. It is also of a more rigid texture ; the pinnæ lobed or pinnatifid.

The variety ASPIDIUM ACULEATUM ANGULARE is recognized by Moore and some other authors as a distinct species. It is a rather larger, more luxuriant, and less stiff variety ; more divided than *Aspidium aculeatum*. The fronds lax, drooping, and lanceolate, with more distinct segments ; the lower pinnæ evidently stalked.

The whole plant has a very vigorous appearance, and retains its green colour even in winter. The stalk is covered with a mass of scales of a rust-red colour, which are distinctly observable even in the young plant. Mr. Newman mentions a property as belonging to this fern, which, though common to many exotic species, is not found in any other British fern—that of producing new plants from “bulbilli, which originate from the main or partial rachides at the axillæ of the pinnules.” This condition of the plant was fully described by Professor Kinahan, in a paper read before the Dublin Natural History Society, in June 1852. If these bulbilli be taken off the parent pinnules and planted in a good light soil, they will grow with great rapidity, and form strong plants.

HOLLY OR ROUGH ALPINE SHIELD FERN.

ASPIDIUM LONCHITIS,

Swartz, Smith, Hooker, and Arnott.

(Plate II. Fig. 3.)

SYNONYMS.

Polystichum Lonchitis, Roth, Babington, Moore, Newman.

Polypodium, Linnæus.

THIS is a rigid and prickly-looking plant, whence comes its English name. The fronds grow in a tuft from the extremity of a very slowly lengthening rhizome. The size of the fronds is very variable, from a few inches to a foot and a half in height; they are generally of a rigid texture, but this depends greatly on situation; sometimes they are thinner and spreading, or even almost pendulous. The colour is of a deep glossy green in the Irish and Scotch specimens, while in the English and Welsh it is duller; and the whole plant is not so prickly and holly-like as in the Irish and Scotch plants. The margin of the fronds is set with spinous teeth. The sori are circular, disposed in long series on each side of the mid-rib, and often become confluent in maturity.

This rare fern seems to have been very familiar to older botanists and herbalists, and is frequently mentioned by Ray, Gerarde, and others. It is exceedingly difficult of culture, and even when established, is often disappointing to the cultivator; for it is only seen in

perfection on its native rocks, in the open air in Ireland, Scotland, or Wales. In the south of England it seldom thrives, and, on this account, is best left out of a growing collection of ferns.

The groups of ferns now called *Nephrodium* was formerly known as *Aspidium*, afterwards as *Lastrea*—but we have adopted the most recent name according to modern botanists. Its distinguishing characteristic is a notch in the otherwise round involucre which changes the simple circle into a heart or kidney-shape. Many of the largest and most elegant ferns belong to this group. *Nephrodium* is from a Greek word signifying kidney, in allusion to the form of the involucre.

CRESTED BUCKLER FERN.

NEPHRODIUM CRISTATUM,

Swartz, Smither, Hooker.

(Plate III. Fig. 1.)

SYNONYMS.

<i>Aspidium cristatum</i> ,	Swartz,	<i>Polypodium cristatum</i> ,	Linnaeus.
Smith.		<i>Polypodium Callipteris</i> ,	Ehrhart.
<i>Lastrea cristata</i> ,	Babington,	<i>Lophodium Callipteris</i> ,	Newman
Presl, Moore.			

THIS fern is not very common in England, but is easy to distinguish from other species. It is more prized for its rarity than its elegance. The fronds are but few in number, and rise from the crown of each growing branch of the rhizome, which is stout and strong.

PLATE III.

1. CRESTED BUCKLER FERN (*Nephrodium cristatum*).
See Page 34.
2. BROAD PRICKLY-TOOTHED FERN (*Nephrodium dilatatum*). See Page 36.



1. CRESTED BUCKLER FERN.

2. BROAD PRICKLY-TOOTHED FERN.

They attain a height of two or more feet under favourable circumstances, and are peculiarly erect, narrowing towards the upper part. Rather more than a third of the stem is bare of pinnæ, and covered with pale brown membranous scales. The sori are in two single rows, between the margin and the centre of the frond, and generally on the upper pinnules. The fronds appear in May, and the fructification is matured about August or September, soon after which, except in very mild seasons, they perish by frost. This fern is often confounded with *Nephrodium Filix Mas*, which, however, differs in many important points, as will be seen.

This plant is very local in its distribution, being confined to boggy heaths and moors, and occurring but in four counties of England; viz. Nottinghamshire, Cheshire, Norfolk, and Suffolk. The places recorded as producing it, are Bansey Heath, near Lynn, Fritton, Dersingham, and Edgefield, in Norfolk; Oxton Bogs and Bulwell Marshes, in Nottinghamshire; and Wybunbury Bog, in Cheshire. The Suffolk station is doubtful, but Mr. Davy is said to have gathered it on bogs among alder-bushes, at Westleton, in that county. Mr. Mackay gives this fern as a native of Ireland, and Sir W. Hooker as a native of Scotland. It is not uncommon in moist and boggy places in Europe, Asia, and North America.

It is not a difficult fern to cultivate, and bears a change of condition better than many plants which

are considered more hardy. It succeeds best in a turfy peat soil without any admixture, and bears drought better than would be imagined from its love of damp shady situations. It is better adapted for out-door cultivation than for glass.

BROAD PRICKLY-TOOTHED OR CRESTED FERN.

NEPHRODIUM DILATATUM.

(Plate III. Fig. 2.)

SYNONYMS.

<i>Lastrea dilatata</i> , Presl, Babington, Moore.		<i>Aspidium dilatatum</i> , Hooker and Arnott.
		<i>Lophodium multiflorum</i> , Newman.

THIS is one of the most common and generally distributed of British ferns, growing in woods and on sheltered hedgebanks everywhere. It is classed by many botanists as a variety only of *Nephrodium spinulosum*. Sir W. Hooker favours this view, though by Mr. Moore and Mr. Lowe it has many varieties attached to itself; but who shall decide where botanists disagree? For all our purposes we may consider it, I think, a distinct species. Unlike *spinulosum*, the rhizome is not all creeping, it rarely branches, but forms a strong, enduring, erect, stem-like base, that not unfrequently rises from six inches to a foot above the soil. The fronds are pinnate; the pinnæ nearly opposite; the pairs gradually approximate from the base towards the apex; the first and second pairs are

very broad at the base, the third pair longer and narrower, and so on with the rest until they reach the apex of the frond. According to Babington, this species is distinguished chiefly by having the stipes clothed with long, pointed scales, with a dark centre and diaphanous margin. It is a very variable fern, and can with difficulty be recognised as a species even by the experienced botanist. Mr. Johnson likens the clusters of this noble fern to Corinthian columns, the caudex and base of the fronds representing the column, and the feathery arching foliage the capital. Its colour is sunny green, often shading to a delicate tint at the points of the pinnæ. It is a fern worthy of all admiration, and in its native position—bending over the waters of some gurgling stream, with its arched fronds sprinkled with dew, like diamonds—it is a beautiful object to behold. It flourishes best in a rich loam soil with abundant moisture.

MALE BUCKLER FERN.

NEPHRODIUM FILIX MAS,

Hooker.

(Plate IV. Fig. 1.)

SYNONYMS.

<i>Aspidium Filix Mas,</i>	Swartz,		<i>Lastrea Filix Mas,</i>	Presl, Babington.
Smith, Bentham.			ton.	
			<i>Dryopteris Filix Mas,</i>	Newman.

THIS is a most abundant fern, deriving its name from its robust appearance in contrast with the more

delicate though similar Lady Fern, *Nephrodium Filix Fœmina*. The stipites or stalks are densely scaly. The fronds grow in circular clumps about two or three feet in height: they spring in a circular manner from the large scaly rhizome, and, in the early part of the year, as they uncoil themselves from their ring-like condition have a very beautiful appearance. The upper and lower pinnae are much shorter than those of the middle, which gradually taper off to the point. The fronds are from five to ten in number; their position nearly erect, or radiating from the centre. The sori are rather large on the upper branch of the forked lateral veins, and covered by a conspicuous kidney-shaped indusium, which is attached to the vein just at the point where the stalks of the capsules are situated. It is one of the best species to study, with a view to understand the fructification of ferns, on account of the prominence of the indusium in fully-developed fronds. It is of a more permanent character than most other British ferns.

The Male Fern is found in every country of Europe and Northern Asia, and has been collected in Africa; but is not recognised as belonging to America. It delights in woody and shady districts, and may be found in almost every country ramble in England. It is most abundant in cultivated districts, and in rich soils it lives to a great age; the fronds of each succeeding year appearing to increase in size. [Were this a rare fern, it would be greatly prized, but, being

common, it is less appreciated than it deserves. In olden times, however, it was the hero of the fern tribe. It is supposed to be the fern that supplied the mystic fern seed gathered so ceremoniously on St. John's Eve, and imparting the marvellous power to "walk invisible." Gathering fern seed was ever associated with witchcraft and demonology. Newman tells us that "Vagabonds" used to make "lucky hands" or "St. John's hands," out of the curled-in young fronds, and sell them as charms to put on the troughs from which cattle drank.]

The medicinal properties of the Male Fern have been held in high repute for many years; it is even now retained in our Pharmacopœias as a vermifuge, and was recommended by Theophrastus, Dioscorides, and Galen. Lately it has been extensively employed as a remedy for tapeworm, and with good effect.* Tragus has a very curious passage on the subject of its curing wounds caused by reeds, and says that the antipathy of the Male Fern and the Reed is so great, that the one will not grow in company with the other. The same author also recommends a piece of the root of the Male Fern to be laid under the tongue of a horse that may have fallen sick from any unknown cause; by which means the disease will be expelled,

* The attention of modern medical practitioners was probably first directed to it in consequence of its being the ostensible remedy of Madame Norisser, of Switzerland, who sold her secret method of expelling tapeworm to Louis XVI. for 18,000 francs.

and the horse restored to health. Even the homœopathic Pharmacopœia recognises the use of the *infusion* of Male Fern roots as an agent in medicine.

Schkuhr speaks of the ashes of this fern being used in bleaching linen and in the manufacture of glass ; also of an extract obtained from its roots as used for tanning leather. Parkinson also mentions it as forming an ingredient in the making of a coarse green glass in France and in England, in his time. In Norway it is employed as fodder for cattle, when dry as litter, and when decayed as manure. It is very amusing to find among old botanical writers the curious and often absurd uses to which they assign various vegetable productions ; and while repudiating many that have been formerly received, and lamenting the ignorance and folly of past times, they themselves were perpetuating and fully believing in even greater absurdities. Thus Gerarde, who warns his readers against too ready a faith in the virtues of the Male Fern, asserts his own implicit belief in the marvellous fable of the production of the barnacle goose from the blossom of the trees, which overhang the water, being converted into sea acorns or barnacles, and then hatching into a white feathery goose. A species of *Nephrodium*, growing in Russia and Tartary, and very nearly allied to the *Nephrodium Filix Mas*, is the Scythian or Tartarian lamb, about which so many wonderful tales have been told, that the world has doubted whether or not to credit them. Struys, who

travelled through Russia and Tartary in the middle of the seventeenth century, gave one of the earliest and best accounts of this curious plant. He says "it has the shape and appearance of a lamb, with feet, head, and tail distinctly formed: its skin is covered with a white down as soft as silk. The Tartars and Muscovites esteem it highly, and preserve it in their houses with great care. The sailor who gave me one of these precious plants, found it in a wood, and had its skin made into an under waistcoat. I learned at Astrachan that the lamb grows on a stalk about three feet high; that the part by which it is sustained is a kind of navel, and that it turns itself round and bends downwards to the herbage, which serves for its food. They also said that it dies and pines away when the grass fails. They added, that the wolves are very fond of these vegetable lambs, and they devour them with avidity, because they resemble in taste the animal whose name they bear; and that in fact they have bones, flesh, and blood; and hence they are called zoophytes, i. e. plant-animals. Many other things I was likewise told, which might, however, appear scarcely probable to such as have not seen them."

This wonderful tale of Struys's, though of course much exaggerated, is based on truth. The rhizoma of *Nephrodium* or *Aspidium Barometz* does, when the fronds are removed, somewhat resemble a lamb in appearance, and is covered by a soft downy substance, which may be compared to a fleecy coat. Like the stems of other

ferns, the inner parts are soft and pulpy, and have a sort of flesh-colour ; the sap is also of a rich red hue, resembling blood ; so that from these materials the inventions of the wonder-loving peasantry of Tartary formed the fable which met with ready belief from the credulous traveller, who was strongly imbued with the love of the marvellous, so common in the age in which he lived. This fern, however, possesses astringent properties in a somewhat greater degree than other species, and was formerly in repute as a styptic. Fresh plants were often brought to the markets at Macao, but none ever reached this country alive.

Nephrodium Filix Mas has been often employed in brewing, as a substitute for hops, and has been found to be one of the most successful ingredients in beer when hops are absent.

VARIETIES.

NEPHRODIUM FILIX MAS INCISA is a larger and more striking plant than the normal form, more robust, and sometimes growing to a height of three or four feet. The fronds are directly bipinnate and lanceolate, not contracting abruptly at the apex. The veneration is more distinctly and clearly developed. The pinnules are longer, narrower, and more distant ; the first upper pinnule is generally much longer than the first inferior. This variety is called by many writers *Lastrea erosa*, or *Aspidium Filix Mas erosa*.

NEPHRODIUM FILIX MAS PALEACEA (or BORRERI,

as it is sometimes called), has lanceolate fronds of a yellowish kind, and bright golden scales on the rachis. It also differs from the other varieties in having purple ribs and veins, and in the sides of the indusium being inflated beneath the spore-cases. A very curious form of the Male Fern has the points of the fronds and of the pinnæ divided into a fringe or tassel—a curious transformation which occurs in British species only in this and the Lady Fern.

NEPHRODIUM FILIX MAS PUMILA is permanently smaller than the original plant, seldom reaching more than a foot in height. The pinnæ are short, bluntish, and pinnatifid. The sori are borne only on the lowest anterior branch of each pinnule. It is of rare occurrence, but seems to have been brought originally from Snowdon. When fresh, the young fronds have a sweet fragrant smell, something like mignonette.

NEPHRODIUM FILIX MAS ABBREVIATA is a permanently small form of the Male Fern, about a foot in height, in which the pinnules become rounded lobes, and the fructification forms a line on each side of the mid-vein of the pinnæ. It is found in woods and banks in Cumberland and Yorkshire.

When planted in the fernery, the common Male Fern, as well as all its varieties, grows well and luxuriantly ; if only space enough be allowed for its roots. It does not require so much shade as many other ferns, and will bear sunshine.

MOUNTAIN BUCKLER FERN.

NEPHRODIUM OREOPTERIS,

Swartz, Smith, Hooker.

(Plate IV. Fig. 2.)

SYNONYMS.

<i>Lastrea Oreopteris</i> , Presl, Babington (Sweet Mountain Fern).		<i>Lastrea montana</i> , Newman.
		<i>Polypodium fragans</i> , Linnæus.

THIS is a difficult fern to distinguish from *Nephrodium Filix Mas*, especially when fully grown. Its fronds are lance-shaped. The pinnules dwindle at the base to a mere leafy excrescence close to the ground. The sori are placed like beads under the edges of the lobes, which do not turn back as in the Marsh Fern (*Thelypteris*). Over every portion of the under surface lie numerous small, round, shining, bright-yellow glands, which give the young fronds a golden tinge, and when rubbed or bruised emit a pleasant resinous odour. The fronds make their appearance about the beginning of May, and before they unfold look like little silver balls amidst the grass. They attain a height of two or three feet, and sometimes even of five feet, according to situation. It delights in exposed and healthy places, and dry pastures, and is found more or less throughout Europe in open districts. It grows on Hampstead Heath, Wimbledon Common, and Blackheath; also at Tunbridge Wells, and is abundant in Scotland. A special characteristic of this fern is mentioned by Mr. Newman, which is worthy of

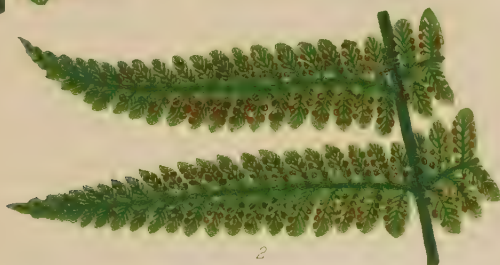
PLATE IV.

1. MALE BUCKLER FERN (*Nephrodium Filix Mas*).
See Page 37.
2. MOUNTAIN BUCKLER FERN (*Nephrodium Oreopteris*).
See Page 44.
3. RIGID BUCKLER FERN (*Nephrodium rigidum*).
See Page 46.





1



2



3

1 MALE BUCKLER FERN.

2. MOUNTAIN BUCKLER FERN

3. RIGID BUCKLER FERN.

observation. He says: "Immediately the fronds begin to unroll, they exhibit the pinnæ placed at right angles with the main stem, and are not convolute, as in the allied ferns."

Many persons complain of great difficulty in rearing or establishing *Nephrodium Oreopteris*, which after a time fades and dies, and it is almost impossible to cultivate it with other ferns in a closed case, as it requires so much more moisture than most others. The best plan to secure its continuance is to transplant it with some of its native earth into a pot with pure loam, and to keep the soil wetted during the winter, either by a constant flow of water from a siphon, or by a saucer full of water, in which it may stand. The first plan appears the best, and might be adapted to a green-house or rock-work, in which the fern might be planted. Each plant seems to adapt itself to the circumstances by which it is surrounded in its earliest state; and in transplanting wild ferns it is well to observe these closely, and adapt the artificial treatment as much as possible to them, not following exactly any one rule for the treatment of any one species. There is no difficulty in obtaining young shoots of this fern, as the seedlings are always most abundant.

RIGID BUCKLER FERN.

NEPHRODIUM RIGIDUM,

Swartz, Smith, Hooker.

(Plate IV. Fig. 3.)

SYNONYMS.

Lastrea rigida, Presl, Babington. | *Lophodium rigidum*, Newman.

THIS species may be known from those to which it is allied by several characteristics. The fronds are comparatively small, generally broadest at the base, always covered with minute glands, bipinnate; the segments two to five-lobed, not spinulose; the stem always covered with long pointed scales, and, like the Mountain Fern, it has a peculiar fragrance when bruised. The veining is similar to that of the large variety of *Nephrodium Filix Mas*. The fructification is borne on the lowest anterior branch of each venule. The indusium is conspicuous and persistent.

This seems to be a very local species, being almost exclusively confined to the mountainous limestone districts of the north of England. It was first discovered as a British fern by the Rev. Mr. Bree, at Ingleborough, and has since been found abundantly in the limestone districts of Yorkshire and Lancashire.

It grows with vigour in common garden soil, requiring no shade, but enjoying moisture. Its culture is similar to that of the other large-growing kinds, the only important points being to secure moisture and good drainage. The introduction of limestone in its

PLATE V.

1. BROAD PRICKLY BUCKLER FERN (*Nephrodium spinulosum*). See Page 47.
2. MARSH BUCKLER FERN (*Nephrodium Thelypteris*). See Page 49.



1



2

bed is suggested by its natural habitat; but this does not seem to be essential to success. It is not one of the most attractive of the ferns, but is valuable in grouping, as forming a contrast with the more ornamental species. The rhizome should not be buried, but the crown left above the surface.

BROAD PRICKLY BUCKLER FERN.

NEPHRODIUM SPINULOSUM,

Smith, Hooker, Bentham.

(Plate V. Fig. 1.)

SYNONYMS.

<i>Lastrea dilatata</i> .	<i>Lastrea Fœnisecii</i> , Watson.
<i>Lastrea spinulosa</i> , Presl, Babington, Moore.	<i>Lophodium uliginosum</i> , Newman
<i>Lastrea spinosa</i> , Newman.	<i>Aspidium dilatatum</i> , Smith.
	<i>Aspidium recurvum</i> , Bree.

THIS is the most variable of all our Buckler Ferns, and is difficult to distinguish from others, of which, indeed, it is regarded as a variety by many botanists, and we find it described under various names in different books. It is nearly allied to the Male Fern, but is not so tall, of a paler green, and very much broader; the general outline is nearly ovate, from one to two feet long, or rarely more; the lowest pair of pinnæ not much shorter, and sometimes longer than the others. The fronds are bipinnate; the segments of the pinnæ deeply toothed, pinnatifid, or thrice-pinnate. Its chief characteristics are the lower pinnæ not decreasing in size, and the sori, which are circular,

being covered by a kidney-shaped indusium, having the margin entire. The plant in the Royal Gardens, Kew, under the name of *Lastrea uliginosa*, corresponds with this species.

It is one of the most common and generally distributed of our British Ferns, growing in woods and on sheltered banks throughout the kingdom. It is common on the continent of Europe and Russian Asia ; and is to be found in Epping Forest, near London, in Cheshire, Norfolk, and Nottinghamshire.

This fern is by no means difficult to cultivate. It will bear exposure, if well supplied with water ; but to obtain it in its beauty it must be screened from the direct heat of the sun. When potted, it requires nothing but peat, and should be kept constantly standing in water. It is often mistaken for *Nephrodium dilatatum*, especially when dried ; as, indeed, in this state all plants are more difficult to recognise than when freshly gathered. Useful as is the herbarium in preserving the outlines of each plant, its style, tints, character, and texture, must of course be lost in the sameness of one now uniform body. It is

“ And yet it is not ; no more than the shadow
Upon the hard, cold, flat, and polished mirror
Is the warm, graceful, rounded, living substance
Which it presents in form and lineament.”

SIR WALTER SCOTT.

NEPHRODIUM SPINULOSUM RECURVUM is a variety figured in our plate ; it differs from the original fern

only in the pinnules being somewhat smaller and narrower, and a trifle curved forward in their margins, so as to present a prickly-looking surface, like that of holly.

MARSH BUCKLER FERN.

NEPHRODIUM THELYPTERIS,

Swartz, Smith, Hooker, Bentham.

(Plate V. Fig. 2.)

SYNONYMS.

Lastrea Thelypteris, Babington, Presl, Moore.*Hemestheum Thelypteris*, Newman.

THIS fern has been described by botanists under the generic names of *Polypodium*, *Acrosticum*, *Lastrea*, and *Polystichum*, but has always retained its specific name, *Thelypteris*, which really means woman fern, referring possibly to its delicate growth. It has a short creeping root-stock, with single (not tufted) erect fronds, which are bipinnate and without glands. The fronds are of two kinds, barren and fertile; the former appear in May, the latter in July. The pinnules of the young frond stand out at right angles with the stem. The fertile fronds are much taller than the barren ones, sometimes attaining a height of three feet. The indusium covering the spore-cases is thin, and soon thrown off and lost.

This fern delights in marshy, boggy lands, and is found amongst sundews, heather, and asphodels: its distribution is very general. Where the soil is light

and moist, so that the rhizome may extend itself with freedom, it is most abundant. It has disappeared from many districts where it once grew, on the introduction of drainage; this peculiarity will suggest the necessity for preventing the escape of moisture from its roots in cultivation. In this country its distribution may be considered somewhat local, but it is to be found in most English counties, though rarely in Ireland and Scotland. In Wales it is not unfrequent, and near London it grows on Wimbledon Common and in Epping Forest. A botanical collector and enthusiast, writing from a spot in Warwickshire, where this fern formerly abounded, regrets its absence, and attributes it rather to the rapacity of other collectors than to the introduction of drainage and cultivation. It should be borne in mind in gathering specimens for the herbarium, or in taking roots for cultivation under other circumstances, that in no place will the plant thrive so well as in its native soil, and that to remove the whole of a rare plant is perhaps to exterminate it for ever. Notwithstanding the difficulties we may expect to find in growing this fern artificially, Mr. Sowerby assures us that he has grown specimens for many years in common garden loam, the roots covered with black peat to prevent evaporation, and having no more than the usual watering given to its neighbours.

PLATE VI.

1. BLACK SPLEENWORT (*Asplenium Adiantum nigrum*).
See Page 51.
2. LADY FERN (*Asplenium Filix Femina*). See Page 52.



1. BLACK SPLEENWORT.

2. LADY FERN.

THE BLACK SPLEENWORT.

ASPLENium ADIANTUM NIGRUM,

Linnæus.

(Plate VI. Fig. 1.)

THE generic name of this family of ferns is derived from the Greek word *Asplenon*, a name given by old authors to a fern said to be a remedy in diseases of the spleen.

This species, often called Black Maiden Hair, grows from six inches to a foot in height. The fronds are triangular or broadly lanceolate, the dark shining purple or black stalk being often as long as the leafy part. They are of a thick firm texture, with numerous veins, and of a dark green colour. They are bipinnate, or sometimes tripinnate, the pinnæ gradually decreasing and less divided towards the point of the frond. The sori are at first distinct, placed near the mid-rib; but as the plant becomes older, they are generally confluent in a mass, often covering the whole under-surface of the pinnule. It is one of the latest of our ferns in unfolding its fronds, which are not often open until the middle of June.

It is a conspicuous ornament of the situations where it occurs; chiefly on old walls, or hanging in graceful sprays over rocks, or on the hedgebank of the dry but shady lane. The fronds grow erect or stooping, according to the position of the plant; they have

generally a triangular outline. They are not crisp, like the fronds of most of our ferns, but have a leathery sort of texture, and are much veined. It is found only very sparingly in Ireland. This fern does not thrive well in the closed case, but does best on rock-work in the open air, in a shady situation.

When this fern assumes a much more blunt form, it constitutes the variety called by botanists *Asplenium Adiantum nigrum obtusum*; while sometimes it acquires a tapering slender shape, and is then called *Asplenium Adiantum nigrum acutum*; both these forms are rare in this country—on the Continent they are well known, and are considered so permanent as to be ranked as species.

Obtusum is found in dry, exposed places—*acutum* in sheltered, shady spots.

LADY FERN.

ASPLENIUM FILIX FÆMINA,

Bentham, Bernhardt, Hooker, and Arnott.

(Plate VI. Fig. 2.)

SYNONYMS.

<i>Athyrium Filix Fæmina</i> , Babington, Moore, Newman.		<i>Aspidium Filix Fæmina</i> , Swartz, Smith.
		<i>Polypodium Filix Fæmina</i> , Linnæus.

THIS is the most lovely of our British ferns, and by its delicate cutting, its bright green colour, and exquisite grace of form, has gained special admiration from

those who find it in its native haunts. Its habit is tufted; it has the short woody root-stalk of the Male Fern, but is more divided; the stalk is less scaly, and the sori different. The fronds, which appear in May, are lanceolate, twice pinnate; the pinnules deeply cut or pinnatifid; the lobes sharply toothed. At first the veneration of the fronds is circinate, but as they advance, the apex becomes free and hangs down, as in *Nephrodium Filix Mas*, assuming the appearance of a shepherd's crook. The fronds are exceedingly fragile, and wither almost immediately on being gathered. The sori are very abundant, covering the back of the pinnule; they are shortly oblong, diverging from the centre of the segments, with the indusium attached along one side, as in other spleenworts, but showing an approach, by the kidney shape of some of them, to the Buckler Fern.

The varieties of this fern are very numerous, many only dependent on situation and circumstances, but some decidedly persistent. Professor Lindley enumerates seven permanent monstrous forms.

The fructification of the Lady Fern is so abundant that Sir J. E. Smith has remarked: "If a single plant were uninterrupted in its possible increase for twenty years, it would cover an extent equal to the surface of the whole globe."

The Lady Fern is distributed more or less all over the British Isles, its favourite resort being moist warm woods; but it does not shrink from the exposure of

open moors and naked hill-sides. In Ireland it takes the position of our common brake, and, like that, is employed as a packing material for fish and fruit. It is found in Scotland, and is alluded to by Sir Walter Scott in 'Waverley,' who expresses its love for moist, shady woodlands thus :

“Where the copse-wood is the greenest,
Where the fountain glistens sheenest,
Where the morning dew lies longest,
There the Lady Fern grows strongest.”

It occurs in Europe, Asia, Africa, and North America, though the specimens sent from America differ in many respects from the true Lady Fern.

No collection, either in the open air or in a case, is complete without the beautiful Lady Fern. It bears civilisation admirably. In rock-work it should occupy a low, boggy situation, as it loves shade and moisture, planted among turfy soil, kept well moistened and drained. Placed at the edge of a cavern or pool of water, no object can be more lovely, and nothing will grow so freely. A modern writer says—

“Supreme in her beauty, beside the full urn,
In the shade of the rock stands the tall Lady Fern.”

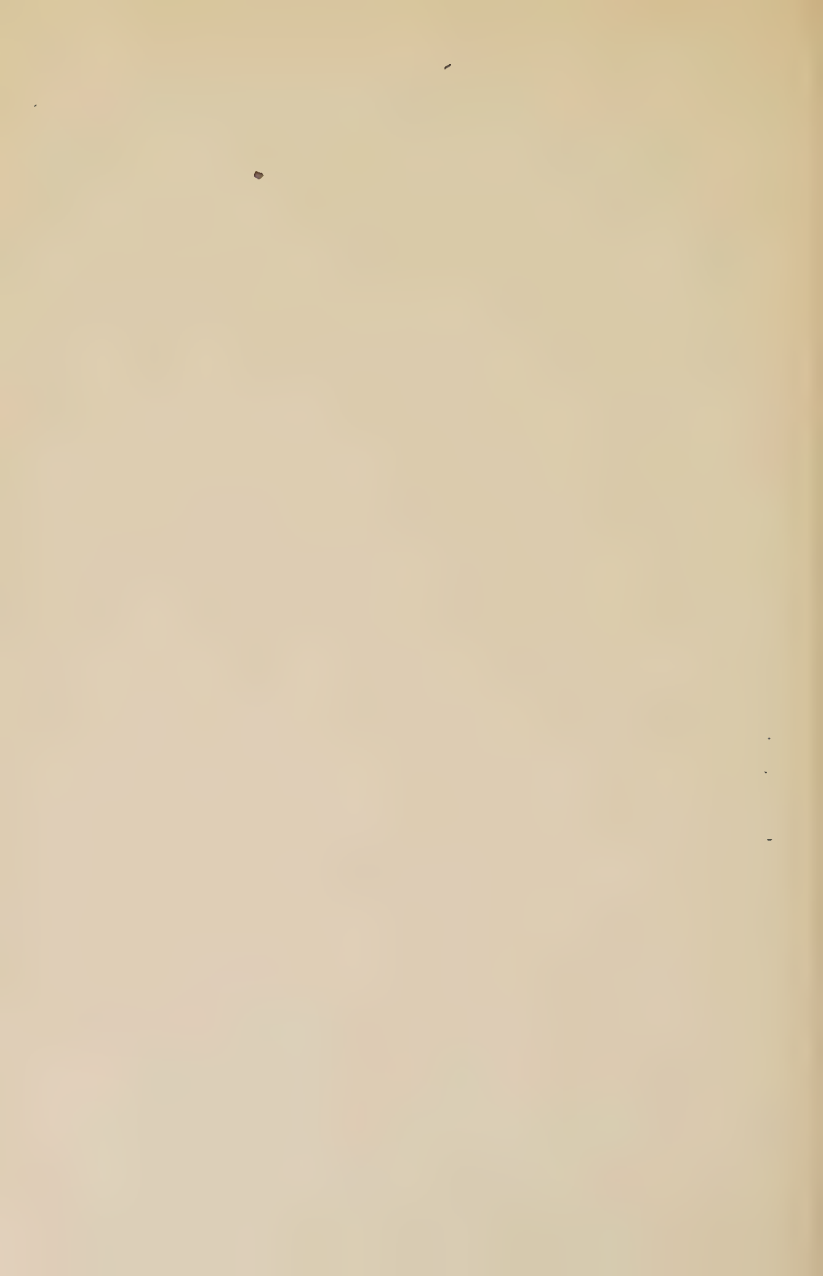
VARIETIES.

Among the varieties of the Lady Fern we would mention as most persistent :—

ASPLENIUM FILIX FÆMINA LATIFOLIUM, known by its more hardy appearance—broader pinnules,

PLATE VII.

1. SMOOTH ROCK SPLEENWORT (*Asplenium fontanum*).
See Page 55.
2. ALTERNATE-LEAVED SPLEENWORT (*Asplenium
germanicum*). See Page 57.





1. SMOOTH ROCK SPLEENWORT

2. ALTERNATE-LEAVED SPLEENWORT.

which are set more closely together, lobed and deeply cut at the edges, almost to the mid-rib.

ASPLENIUM FILIX FÆMINA CONVEXUM is also very distinct ; it has more slender fronds than any form of the Lady Fern, and its pinnæ and pinnules are smaller.

ASPLENIUM FILIX FÆMINA MOLLE has a short stalk, with broad and short scales. The frond rarely exceeds a foot in height, and is erect and of a bright green colour. Its outline is egg-shaped and lanceolate.

SMOOTH ROCK SPLEENWORT.

ASPLENIUM FONTANUM,

Bernhardi, Smith, Hooker and Arnott, and R. Brown.

(Plate VII. Fig. 1.)

SYNONYMS.

<i>Athyrium fontanum</i> , Presl and Babington.	and	<i>Aspidium fontanum</i> , Swartz. <i>Polypodium fontanum</i> , Linnæus.
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THIS is one of our rarest British ferns ; indeed, some botanists regard it as an alien. It is a small tufted-growing species, seldom seen more than three or four inches in height. The small fronds are evergreen, and mostly grow upright ; the upper surface is deep green, the under part of a lighter shade. It greatly resembles *Asplenium lanceolatum*, but is distinguished by its winged rachis. The sori are two to four on each segment, oblong and distinct when young, but when old

united into an irregular mass, covering the upper part of the segment.

This fern may be considered a rarity in England, but is sometimes met with on old walls and rocks. It was described by Hudson as growing near Wybourn, in Westmoreland. It formerly grew on the walls of Amersham Church, in Buckinghamshire. It has been found at Matlock, in Derbyshire, and on a very old wall at Tooting. Specimens exist in the collection of the Botanical Society of London, said to have been gathered in Wharnccliffe Wood, in Yorkshire. Throughout the continent of Europe, chiefly near the sea, in Madeira, and northward to the English Channel, this fern is found. It is recorded by Pallas as being a native of the Ural Mountains, in Siberia.

In the open air this pretty little fern is not very successful, and is exceedingly liable to die off in the winter, unless great care with regard to shade, shelter, and moisture, be taken ; but under glass, in a Ward's case, or in a greenhouse, there is no difficulty in rearing it. In a small collection it is particularly desirable, from its small size and evergreen habit. Sandy peat, well drained, suits it best ; and it is well to raise the caudex a little above the level of the soil, by means of pieces of soft sandstone.

ALTERNATE-LEAVED SPLEENWORT.

ASPLENIUM GERMANICUM,

Weiss, Babington, Moore, and Benthall.

(Plate VII. Fig. 2.)

SYNONYMS.

Asplenium alternifolium, Wulfen, Smith, Hooker, and Arnott.*Amesium germanicum*, Newman.

THIS is very like the last species, and is perhaps only a variety, but the segments are much narrower. It grows in little tufts. The whole frond is narrow usually—simply pinnate—with the lower segments three-lobed, or very rarely bearing three distinct segments. The pinnæ have two or three distinct lines of sori crowded on their under surface, which ultimately meet in the centre. The indusium is *entire* at the edge, not jagged, as in the Wall Rue.

This is, perhaps, the rarest of our British ferns. There is little to distinguish it from *A. Ruta muraria*. It has very seldom been found in England, Wales, or Ireland, and rarely in Scotland. Mr. Newman mentions three localities there where it has been gathered; viz.—near Dunfermline, Dunkeld, and on rocks on the Tweed, two miles from Kelso. In other parts of Europe it is occasionally seen, but grows very sparingly.

The scarcity of this fern prevents our saying much as to its artificial growth in the open air.

It is much prized in Germany and the south of France, and is frequently brought here from thence

as a foreign plant. We have seen it growing luxuriantly in a glass case, in the smoky atmosphere of London; but it is seldom that it succeeds so well in artificial circumstances. In attempting its cultivation, however, care must be taken that moisture should not accumulate on the fronds, or stagnate about the roots; it must be kept as dry as possible without causing positive drought.

LANCEOLATE SPLEENWORT.

ASPLENIUM LANCEOLATUM,

Smith, Moore, Babington, and Newman.

(Plate VIII. Fig. 1.)

THIS is a low tufted fern, with twice-pinnate lanceolate fronds, which are usually three to six inches high, the longest pinnæ rather below the middle of the frond. They are ovate, deeply and sharply toothed or lobed. The sori are two to four on each segment, distinct and oblong when young, but when old united into an irregular mass, and covering the upper part of the segment. It is not in perfection until September or October, and remains green through the winter.

This plant was well known to John Ray and the older botanists; it is one of the few species that have escaped all confusion in nomenclature.

It is a very local fern, and though not confined to

PLATE VIII.

1. LANCEOLATE SPLEENWORT (*Asplenium lanceolatum*).
See Page 58.
2. SEA SPLEENWORT (*Asplenium marinum*). See Page 60.



1. LANCEOLATE SPLEENWORT.



2. SEA SPLEENWORT.

the sea-coast, must be considered chiefly a maritime species ; for, with the exception of Tunbridge Wells and Snowdon, it does not appear to have been found far from the sea. In the south of England, near the coast, it is seen springing out of almost every wall. Among the damp rocks of Lizard Point, in Cornwall, it attains great luxuriance. In the Channel Islands, Jersey especially, it is very abundant.

Like other maritime species of ferns, it is not adapted for out-door cultivation, especially near London. In a hothouse, under a frame, or in a Ward's case, it does well, if properly managed. Probably there may be a little difficulty in a closed case, from its objection to continual moisture without evaporation ; but this can be obviated by securing good drainage, and by occasionally admitting the air into the case.

Mr. Newman gives directions for the cultivation of this fern in a greenhouse, which, if properly attended to, would, we doubt not, secure success. He says :—
“ Fill the flower-pot to the depth of four inches with small pieces of charcoal, in pieces not larger than a hazel-nut, clean silver-sand, fibrous peat chopped into bits, and light friable loam sifted fine, so as to get rid of pebbles ; these ingredients, after being mixed well together, should be passed through a coarse sieve. Hold the fern in the middle of the pot, with the roots spread as widely and loosely as possible, and with an iron spoon fill in the mixture, carefully and equally,

shaking it down until the pot is full. Stand the pot in a feeder, constantly full of water, but supply no water on the fronds or the surface soil."

SEA SPLEENWORT.

ASPLENIUM MARINUM, .

Linnaeus, Smith, Newman, Bentham, and Babington.

(Plate VIII. Fig. 2.)

THIS is a very handsome evergreen fern, and, like the former, is a maritime species. It has pinnate tufted fronds from six inches to a foot in height. It is narrow, lanceolate in outline; the pinnæ are stalked and serrated, connected at the base by a narrow wing extending along the rachis. The pinnæ are unequal at the base, the upper side or edge being much developed, while the lower portion looks as if a piece had been cut off. The sori are borne on the mid-rib; they are linear and large.

It is abundant on all our coasts excepting the eastern side of England. In the south-west of England and in Wales it is most profuse: it abounds about Ilfracombe and Lee in Devonshire. It grows out from the sides of caves near the sea-rocks or cliffs. It is found at Hastings, and as far north as Scarborough, in Yorkshire. In every county in Ireland which borders the sea it is abundant. The visitor to the lakes of Killarney cannot fail to observe this beautiful fern in its

luxuriance on the almost inaccessible rocks which abound there, where, from its situation, it is tolerably safe from the rapacious hands of the fern-collector. In the Channel Islands it is luxuriant. Its European range seems limited to the coasts of France and Spain. It is plentiful in Madeira and Teneriffe.

Although so common a fern on our sheltered sea-coasts, it is very difficult to deal with artificially, and seldom succeeds in the open air—never in the neighbourhood of London. In a Ward's case, however, with the Lanceolate Spleenwort and Maiden Hair, it does exceedingly well in a warm room. They all enjoy warmth, and being all evergreens of moderate size, are well adapted for such a position. It may here be remarked, that for the successful cultivation of all small evergreen ferns of this kind great care must be had to the drainage. Turfy peat and silver-sand, mixed with friable loam, and pieces of porous sandstone or brick added to fibrous loam, is the composition which suits them best. They should never be kept wet, but moderately moistened, and the roots tolerably dry. Separate plants of *A. marinum* may be supplied with water in which half an ounce of common salt to a gallon has been dissolved ; poured in at the root, never over the fronds. This fern is most difficult to dry for the herbarium, on account of the quantity of salt contained in its fronds. It is best to dry it separately, if possible, in order to prevent mischief to other specimens.

WALL RUE.

ASPLENIUM RUTA MURARIA,

Linnæus, and generally adopted.

(Plate IX. Fig. 1.)

SYNONYM.

Amesium Ruta muraria, some Authors.

THIS little fern, if once seen, will be easily recognised. It has densely-tufted, thick, dark green fronds, about two or three inches long. The stalk is more or less pinnately divided. The pinnæ are alternate, having pinnules variable in form, sometimes long-stalked, wedge-shaped, toothed, or contracting into a roundish point above. The sori are linear, becoming united into broad patches when old. The whole form of the plant resembles the Garden Rue.

It occurs abundantly in old walls and rocks throughout England and Ireland. It seems to prefer the artificial position of a wall rather than that of a rock or bank. It is found, however, on Arthur's Seat in Edinburgh, and about the Peak in Derbyshire. It is not very abundant in Scotland. More or less it is met with in every country in the world, and is one of those plants which seems to have deserted its native wilds, and to have taken up its residence near the habitations of men. It may almost be called the Churchyard Fern, being so commonly found on old churches and churchyard walls. In a charming little book on the ferns of Devonshire it is mentioned espe-

PLATE IX.

1. WALL RUE (*Asplenium Ruta muraria*). See Page 62.
2. SCALY SPLEENWORT (*Asplenium Ceterach*).
See Page 64.
3. MAIDEN HAIR SPLEENWORT (*Asplenium Trichomanes*).
See Page 66.
4. HARD FERN (*Blechnum spicant*). See Page 68.



1. WALL RUE.

2. SCALY SPLEENWORT.

3. MAIDENHAIR SPLEENWORT.

4. HARD FERN.

cially as growing inside the tower of Morwinstowe Church, and round about the sad memorials of the drowned and shipwrecked sailors who lie buried there in close proximity to the devouring element which engulfed them. It is not a melancholy fern, and its bright tiny fronds, springing from their resting-places, serve to remind one of the new life which is to come, and of the "haven of rest, where no storms shall blow."

We need walk no farther from London than Greenwich Park to see it flourishing abundantly on the brick walls surrounding a part of the park ; and those who are wishing to meet with it may find it most likely on the first garden-wall they pass by.

Those who desire to domesticate this fern will find it difficult to remove from its native haunts, as its wiry roots seem to intersect the bricks or pieces of rock on which it grows. It should only be removed with a portion of the wall on which it has fixed itself, and then surrounded with brick rubbish, mortar, and sandy peat. In this way it will often thrive well if sheltered from the sun and cold winds. Mr. Newman says :—" It seems to disapprove of the attentions of the gardener, to loathe his waterings and his syringings, to despise his composts, and utterly to eschew the confinement of a bell-glass."

SCALY SPLEENWORT, OR CETERACH

ASPLENIUM CETERACH,

Willdenow, Bentham, Hooker.

(Plate IX. Fig. 2.)

SYNONYMS.

Scolopendrium Ceterach, Smith.*Graminitis Ceterach*, Swartz and
Hooker.*Asplenium Ceterach*, Linnæus.*Ceterach officinarum*, Babington.

THIS is a downy evergreen pretty-looking fern, growing in tufts. The fronds are thick and fleshy, green, and glabrous on the upper side, but underneath thickly covered with brown scales, which completely conceal the sori. The green of the upper surface contrasts prettily with the rust-coloured brown edge formed round the margin by the scales underneath. The outline is long and narrow, very deeply divided into rounded lobes standing in an oblique position towards the mid-rib.

The short tough roots of this fern insinuate themselves into the crevices of old walls and ruins, in rocky places, and especially in limestone districts in England and Ireland. It is rare in Scotland, but is found in middle and southern Europe and in Africa.

On the old walls of churches and ruins this pretty fern seems to be quite at home, and is often found in company with the Wall Rue. It is to be seen on the walls of Jerusalem. Its medicinal properties were at one time thought to be of great value, but it has fallen into disuse with the progress of knowledge, and

the discovery that all these supposed peculiarities, existing in various herbs and plants, depend on some astringent or other principle which is better supplied to the system in a more concentrated form from some other source.

The common name *Spleenwort* takes its origin in a curious story,—that in Cerito there is a river which divides two portions of land, the *Ceterach* growing abundantly on one side of the stream and not on the other. On the side where this fern grows, the pigs are said to have no spleen, but on the other side no such deficiency is recorded. Hence the name *Spleenwort*, or *Asplenon*. To this day, Arabian and other eastern writers believe in the virtues of this fern in diseases of the spleen and liver.

To cultivate this fern with any success, its natural habit must be attended to as much as possible. It does best in the interstices of a wall, where the mortar has begun to crumble. In pot culture the soil should be prepared with great care ; old crumbled mortar, peat earth, and limestone or oolite, should be well mixed together, and placed in shade. It is generally supposed that it is impossible to grow this fern in the atmosphere of London ; yet Mr. Sowerby tells us that the best specimen he ever had flourished in the old wet mortar of a wall in Hatton Garden, where not a ray of sunlight ever reached it, and where the atmosphere was as full of London smoke as it is anywhere.

COMMON WALL SPLEENWORT, OR
MAIDEN HAIR SPLEENWORT.*ASPLENIUM TRICHOMANES*,

Linnaeus, Smith, Newman, Moore, and Babington.

(Plate IX. Fig. 3.)

IT is a pretty little tufted fern, generally from two to six inches high. It has a slender hair-like black stalk, and regularly disposed-of ovate pinnæ forming the fronds. They are of a deep green colour, slightly crenated at the margin. The pinnæ are attached to the rachis by a very short stalk, forming the attenuation of a wedge-shaped base. When old, the pinnæ fall off, leaving the black glossy hair-like stalks naked, mingling with the green fronds.

Both this pretty little fern and its variety *Asplenium viride* are abundant on shaded rocks, in old walls and buildings throughout Great Britain, Europe, Central and Russian Asia (except the extreme north), in North and South America, and in Australia. In the west of England, and especially in Wales, it is a common fern. In the valley of the Wye it grows in profusion, covering whole masses of ground, and presenting a lovely appearance. In Germany there is a legend attached to a well near which this fern grows most luxuriantly. A lady keeping tryst with her lover, he was suddenly, by some evil spell, changed into a wolf. In her terror, she fled before him, and

in her haste fell over a precipice, her beautiful hair becoming entangled in the bushes. Immediately, on the spot, a clear spring welled up, and her hair took root and grew into the lovely fern now called "Maiden Hair Spleenwort." The well is called Wolf's Spring; and after hearing the legend the traveller is expected to take with him as a relic a bunch of "Maiden Hair."

A tea or syrup made of the fronds has long been recommended as a remedy in pulmonary affections.

The Common Spleenwort is easily cultivated, and is one of the prettiest of our smaller ferns. It is well adapted for rock-work or for insertion in the crevices of walls or buildings, where the mortar and brick-work ensures perfect drainage, while it absorbs moisture. In Ward's cases, where its size is suitable, it should have the upper and dry portions of rock-work. From the experiments of Mr. Wollaston it was found that a soil of sandy loam is best adapted for its success, as it requires less moisture than most other ferns; in fact, the crown or centre of growth should never be wetted.

A variety of this fern, believed by many botanists to be a distinct species, *Asplenium Trichomanes viride* (the Green Spleenwort), is known by its stem being green instead of black or dark-brown at the base only.

HARD FERN.

BLECHNUM SPICANT,

Bentham, Roth, Whithering, and Moore.

(Plate IX. Fig. 4.)

SYNONYMS.

<i>Blechnum boreale</i> , Swartz, Smith,		<i>Lomaria spicant</i> , Desveux.
Babington, and Hooker.		<i>Osmunda spicant</i> , Linnæus.

THIS hardy fern has simply pinnate fronds, tufted, of two kinds—fertile and barren. The fertile fronds are in the centre of the tuft, erect, from a foot to a foot and a half high, with narrow acute segments. The lower half of the stem is dark purple, smooth, shining, and naked; the under surface of the pinnæ densely and completely covered with seed. The barren fronds are deeply pinnatifid, from one and a half to two-thirds as high as the fertile fronds; they assume a spreading or horizontal position, and are attached to the caudex by a very short scaly stipet. The fertile fronds arrive at perfection in September, and shed their seed and disappear before winter; but the fertile ones remain green throughout the year.

It is by no means a rare fern, and delights in moist boggy land. It is also found on stony heaths and woods throughout England; indeed, scarcely any lover of wild flowers can fail to have observed it in the hedges among the ferns and grasses of summer. By old writers the plant was called Rough Spleen-

PLATE X.

1. FORKED SPLEENWORT (*Asplenium septentrionale*).
See Page 69.
2. MOONWORT (*Botrychium lunaria*). See Page 71.
3. BRITTLE BLADDER FERN (*Cystopteris fragilis*).
See Page 73.
4. MOUNTAIN BLADDER FERN (*Cystopteris montana*).
See Page 75.



1. FORKED SPLEENWORT.

2. MOONWORT.

3. BRITTLE BLADDER FERN.

4. MOUNTAIN BLADDER FERN.

wort; and old Gerarde, of whom we have before spoken, mentions an "old wife's fable," about the efficacy of this plant, when boiled, in curing diseases of the liver, and "hardness and swelling of the spleen." It is almost in vain to look for this fern on a chalk soil, as it is rarely met with there. Mr. Newman does not recollect having seen a specimen from the chalk hills of Kent, Sussex, or Surrey.

In rock-work, or in any out-door collection of ferns, this *Blechnum* does well, and requires no special attention beyond a sufficient supply of moisture. In transplanting, it is well to bring away a good portion of its native soil around the roots. In cases it does not flourish so well, as it seems to require open air to thrive.

FORKED SPLEENWORT.

ASPLENIUM SEPTENTRIONALE,

Babington, Hocker, Moore, and Bentham.

(Plate X. Fig. 1.)

SYNONYMS.

<i>Acrostichum septentrionale</i> , Lin-		<i>Amesium septentrionale</i> , some
næus.		Botanists.

THIS species, again, is like the Wall Rue, and has similar tufted fronds, but the whole frond is a grass-like spike, forked towards the top, and divided into two or three thickish sharp-pointed segments, about half an inch long, containing on the back two or

more separate lines of sori, which eventually occupy the whole space. The fronds make their appearance in March or April, gain maturity in August, and remain green throughout the winter. There is scarcely any danger of confusing this fern with any other, although its similarity to the *Buckshorn Plantain* might mislead a very casual observer.

It is decidedly a rare British fern. It grows only in the interstices and fissures of rocks and stone walls. It is found at Llanrwst, near Conway, in Wales; in Cumberland, Yorkshire, and some other northern counties of England; and in only two localities in Scotland. Mr. Ward found it plentifully in Somersetshire, and Mr. Newman says Poten, a well-known collector of ferns, brought hundreds of roots from the parish of Culbone, in that county. Gerarde speaks of it as a dweller in the mining districts, and calls it *Muscus corniculatus*. He says, "It riseth from the ground with many bare and naked branches dividing themselves at the top into sundry knags, like the forked hornes of a deere."

When cultivated, it requires the shelter of a close frame or bell-glass. The same treatment may be pursued as with *Asplenium Ruta muraria*, bearing in mind that no superfluous moisture must be allowed. Mr. Wollaston says that it not only requires very careful potting, but great care and attention afterwards. The best soil is sandy peat, with some old mortar mixed with it.

MOONWORT.

BOTRYCHIUM LUNARIA,

Swartz, Hooker and Arnott, Babington, Moore, and Newman.

(Plate X. Fig. 2.)

SYNONYM.

Osmunda lunaria, Linnaeus.

THE frond of this curious little fern rises early in the spring, and in its early stage would scarcely suggest the idea of a fern. An upright simple stem is the first appearance presented, which is, in fact, a bud inclosing the frond, or rather the two fronds, a fertile and a barren one, clasping each other. The stem is separated into two branches, one of which is spreading, leafy, and lance-shaped. The pinnæ are obliquely fan-shaped or lunate segments, of a thick consistence, and entire or crenate. The fruitful branch of the stem is pinnate; the pinnæ generally corresponding in number to those of the leafy branch on which distinct globular capsules are borne, which, when mature, open and allow the seeds to escape. Occasionally, but very rarely, two fertile branches are produced, and there is a variety in which the pinnæ are pinnatifid.

On dry open moors, among harebells and heather, this fern is not uncommon throughout the United Kingdom, but from its diminutive size it often escapes observation. In England it is chiefly found in the counties of Staffordshire, Surrey and Yorkshire, and

also in the Isle of Wight. The curious crescent-shaped pinnæ of this fern, from which it derives its name Moonwort, doubtless induced the older botanists and alchemists to believe in its wondrous potency. From what we can gather about these ancient superstitions, the plants were to be gathered by the light of the full moon, or all their powers were lost. It was supposed that this plant possessed the power of opening locks, loosening fetters, bars, and the shoes from off horses' feet. Withers says, writing in 1622 :

“There is an herb, some say, whose virtue's such,
It in the pasture, only with a touch,
Unshoes the new-shod steed.”

There is a tale told, that the Earl of Essex and his followers being drawn up in a body upon White Down, in Devonshire, near Tiverton, the shoes of their horses fell off, and it was discovered that Moonwort was growing on the heath. To us this story seems very like that told of Tenterden Steeple and the Goodwin Sands.

Our old friend Gerarde makes mention of the use of this fern by alchemists, and as a remedy for “green and fresh wounds.” A large and succulent species of Moonwort is boiled and eaten in the southern states of America.

Of all ferns this is one of the most easy to cultivate, never refusing to grow freely if properly treated. It requires a good depth of soil in the fernery, and must

not be kept too damp. Mr. Newman regards the plant as an underground parasite. The best plan to secure success is to transplant the roots with a portion of the soil in which they are growing, or to remove the sod for some distance round the plant, so as not to disturb it.

BRITTLE BLADDER FERN.

CYSTOPTERIS FRAGILIS,

Bernhardi, Hooker and Arnott, Babington, Moore, and Newman.

(Plate X. Fig. 3.)

SYNONYMS.

Cystea fragilis, Smith.

| *Cyathea fragilis*, some Authors.
Polypodium, Linnæus.

THE whole of this genus consists of small fragile but beautiful and interesting ferns. They are all more delicate in texture than most of our native ferns. The generic name is derived from two Greek words, signifying bladder and fern, and refers to the form of the involucre. The present species has fronds from five to six inches high, growing in tufts. They are lanceolate and twice pinnate. The stalk is erect, slender, dark-coloured, and almost without scales. The veining in the fronds is very evident, owing to their delicate and almost transparent texture. The mid-vein of the pinnules is somewhat winding, with a venule simple or divided, branching off to each lobe, one branch extending to the point of each marginal

tooth. Almost each vein bears at its termination a cluster of capsules of a roundish form, which contain the seeds: these increase very rapidly, and at last become confluent.

This beautiful little fern is distributed widely over the United Kingdom, and prefers moist and mountainous districts, in the fissures of rocks, or the interstices of stone walls. It is rare in Ireland. It is found all over the world in favourable situations, extending even to the Arctic regions. The varieties are easily distinguished. They are:

CYSTOPTERIS FRAGILIS DENTATA, which is smaller than the original fern, and always blunter in form. The veining is similar, but the fructification is at the margin and not near the middle of the secondary vein. One great distinction from the Brittle Bladder Fern is that the clusters of sori as they ripen form a brown ridge on the under surface of the pinnules. It is found in the north of England chiefly.

CYSTOPTERIS DICKIEANA is a variety of *fragilis* having a very compact frond. It may be distinguished by its deflexed overlapping pinnæ; the pinnules decurrent, broad, obtuse, with a few shallow marginal teeth. It is of a deep green colour and very transparent. It has only been found by Dr. Dickie in sea-caves near Aberdeen, after whom it was named.

Few ferns can be cultivated with greater facility

than these. They may be grown in the open garden-border, or in closed cases ; they do best, however, in the open air, as they are subject to the attacks of a red mildew, which is increased by confinement.

MOUNTAIN BLADDER FERN.

CYSTOPTERIS MONTANA,

Link, Hooker and Arnott, Babington, Moore, and Bentham.

(Plate X. Fig. 4.)

SYNONYMS.

<i>Cystopteris myrrhidifolium</i> , Villars,		<i>Polypodium montanum</i> , Allioni.
and Newman.		<i>Aspidium montanum</i> , Swartz.

It grows from four to eight inches high. The root is creeping. The fronds grow simply, and are triangular bipinnate ; the pinnæ of the lowest pair being much larger and more divided than the others. The whole plant greatly resembles the Oak Polypody, only it is of a much more delicate texture. The sori are numerous and circular, very conspicuous when fully grown, and, though crowded, do not run into masses.

This rare species of fern occurs wild only in Great Britain, although it is found in rough and stony places in several parts of the continent of Europe, and in America.

It was first found by Mr. Wilson on Ben Lawers, in Forfarshire, in 1836; and has since been established by other botanists as a truly British species, though rarely to be found.

Little can be said about the artificial treatment of this fern, as it does not appear to have thriven well where it has been tried. Its natural condition, however, would suggest a very open medium for the roots, which thread their way through dripping rocks and constantly abundant though not stagnant moisture.*

FINE-LEAVED GYMNOGRAMMA.

GYMNOGRAMMA LEPTOPHYLLA,

Desveux.

(Plate XI. Fig. 1.)

THIS delicate little fern resembles at first sight very small specimens of the Curled Allosorus (*Allosorus crispus*). It belongs to a group of ferns, which are the pride of conservatories—the gold and silver ferns, as they are called. In this group a delicate orange or white powder covers the under side of the fronds and adds the charm of colour to their beautiful forms. The fronds are in little tufts, ovate, twice pinnate, fragile; the pinnæ roundish, wedge-shaped, three-lobed; the lobes cut and toothed, obtuse. The whole plant is from two to six inches high, with slender black stalks. The sori are oblong, nearly covering the under surface of the segments on which they are borne.

From the recent discovery of this little fern in the

* Mr. Newman suggests a small quantity of sphagnum and charcoal to be mixed with the soil in which it is planted.

PLATE XI.

1. FINE-LEAVED GYMNOGRAMMA (*Gymnogramma leptophylla*). See Page 76.
2. FILMY FERN (*Hymenophyllum tunbridgense*).
See Page 78.
3. WILSON'S FILMY FERN (*Hymenophyllum Wilsoni*).
See Page 79.
4. COMMON ADDER'S TONGUE (*Ophioglossum vulgatum*).
See Page 81.
5. LESSER ADDER'S TONGUE (*Ophioglossum lusitanicum*).
See Page 83.



1. FINE LEAVED GYMNORAMMA.

2. FILMY FERN

3. WILSON'S FILMY FERN.

4. COMMON ADDER'S TONGUE

5. LESSER ADDER'S TONGUE.

island of Jersey, it is now included in the British Flora, although there are but few localities where it is found in Great Britain. It is a native of the South of Europe and of the Atlantic Islands. A correspondent of ours says that it has lately been seen in Devonshire. A diligent search for it in warm sheltered places in our southern counties would, doubtless, repay a collector by its discovery. It is found in a light loamy soil, among mosses and *Marchantia*, near springs, and on shady banks. In the island of Jersey it is widely distributed, the principal localities being near St. Haule, St. Aubin's, and several places near St. Lawrence. In one spot, near the last-named place, it grows plentifully for a considerable distance along a hedgebank, extending as far as the bank is exposed, but ceasing exactly where the lane is shaded with trees.

Mons. Piquet, of St. Helier's, kindly forwarded to us a specimen of this fern taken from a bank with a south-western aspect near that place, not densely shaded by trees, but protected from the direct rays of the sun by dwarf vegetation.

The soil used for this fern should be a light sandy loam. It requires constant moisture, and does well in a closed case. *Marchantia* and mosses should be allowed to grow freely around it. It is strictly an annual fern, and springs up without further trouble after being once established.

TUNBRIDGE HYMENOPHYLE, OR FILMY
FERN.*HYMENOPHYLLUM TUNBRIDGENSE*,Smith, Hooker and Arnott, Bentham, Babington, Moore, and
Newman.

(Plate XI. Fig. 2.)

SYNONYM.

Trichomanes tunbridgense, Linnæus.

THE filmy ferns are moss-like plants, the name is derived from two Greek words, signifying membrane and leaf.

This little fern has a creeping root with minute twisted fibres. The fronds are not above two or three inches long, pinnate, lanceolate in general outline, and of an olive-brown tint. The veins are so strongly marked that they may be said to form the fronds, the leafy part being a very delicate membranous kind of wing on each side. The clusters of capsules are formed round the axis of a vein which runs beyond the margin of the frond: it is inclosed in a kind of cup which forms the involucre.

The tufts of this fern grow so closely together, and are of such a brown tint of colour, that they may almost be taken for a kind of moss, or for a withered plant. The whole family are the smallest of our native ferns, and although so delicate in form and texture, retain their appearance well, when dried, in the herbarium. Both species may be distinguished

from other ferns by the matted growth of their thread-like roots, and their thin membranous appearance.

This fern is not confined to the neighbourhood of Tunbridge Wells, although, being first found there, it was named accordingly. It grows in many parts of the United Kingdom in mountainous and rocky districts; among moss on the trunks and roots of old trees near lakes or rivulets; and in many moist and shady places. It is found in many parts of the Continent; and is everywhere a pleasing variety amidst other ferns and wild plants.

This species, according to Mr. Newman, prefers shade, warmth, and shelter; whilst its ally, *H. unilaterale*, establishes itself on bleak exposed situations.

It can be grown successfully in the open air by imitating its natural condition; and under glass, if certain conditions be attended to; viz.—a close atmosphere, shade, moderate warmth, constant but not stagnant moisture, and a porous surface.

WILSON'S FILMY FERN.

HYMENOPHYLLUM WILSONI,

Hooker and Babington.

(Plate XI. Fig. 3.)

SYNONYM.

Hymenophyllum unilaterale, Willdenow, Moore, and Newman.

THIS plant is regarded as a distinct species by some writers, although it differs so slightly from *Hymeno-*

phylloides tunbridgensis that we can hardly consider it as such, and it requires a practised observer to make the distinction insisted on by botanists. It is found in the same districts, and often accompanies it. Perhaps, however, the variety is the more common in Scotland and in Ireland than the original fern. The principal characters of distinction are found in the fructification. The cups or seed-vessels are larger, the valves more rounded, meeting by their edges, not compressed toward the apex, and never serrated. The darker green hue and coarser texture of the plant will generally enable the collector to distinguish this variety. The pinnae also are turned back in a direction contrary to the fructification.

Mr. Newman gives ample directions for the cultivation of this fern and the preceding species, and suggests that it be grown on the surface of an inverted flower-pot, well covered with a composition of silver sand, peat earth, and loam, resembling mortar, the flower-pot being first filled with wet sphagnum, and mounted into a saucer, likewise filled with sphagnum. The luxuriant growth of the fern is almost certain in this way. Both these ferns are very suitable for closed cases, and do well in them; but we are advised by those who have tried the experiment, to have two small apertures near the top of the glass shade, so as to prevent any retention of stagnant moisture. Mr. Clowes, whose culture of these ferns has been very successful, says that he has observed that the fronds

of *H. tunbridgense* are strictly annual, never growing for more than one year, while those of *H. Wilsoni* go on growing year after year.

COMMON ADDER'S TONGUE.

OPHIOGLOSSUM VULGATUM,

Linnæus, and generally adopted.

(Plate XI. Fig. 4.)

THIS is a curious species of fern, reminding one, in its mode of growth, more of the little plant known by the name of "Cuckoo Pint," or "Lords and Ladies"—*Arum maculatum* of botanists—than of a true fern. It is a small stemless plant, from three to nine inches high. The barren frond, which appears like a single green leaf, smooth, ovate, obtuse, with veins forming a distinct network, seems to inclose the stem or rachis of the fertile frond, which is an upright spike tapering towards the summit, and consisting of two lines of crowded spore-cases buried in the substance of the spike. When ripe, this spike opens and the pollen is discharged, so that the spike eventually resembles a double row of round empty cavities.

This fern should be sought for not later than the middle of June, at which time it is fully developed. It is generally distributed all over England, and is very abundant where it does exist; so much so as to be injurious to other crops in many places. It is

less frequent in Wales, Scotland, and Ireland, but is found on the continent of Europe, Africa, and North America.

The virtues of this plant have been highly extolled by the older writers, and even now large quantities of it are gathered in the villages of Kent, Sussex, and Surrey, and prepared according to the old prescriptions. A preparation, called "Green Oil of Charity," is made from it, and applied to wounds ; and Gerarde says : "The leaves of Adder's Tongue stamped in a stone mortar and boiled in oyle of olive, and then strained, will yield a most excellent green oyle, or rather a balsam, for greene wounds, comparable to oyle of St. John's Wort, if it doth not far surpasse it." We incline to think that the only efficacious part of this ointment was the *oil* of which it was composed. Dr. Lindley, in his 'Vegetable Kingdom,' says : "The herbage of these plants is mucilaginous ; whence the species have been employed in broths. *Ophioglossum vulgatum* has been used in medicine as a vulnerary, but it seems to possess that quality as little as the magical virtues once ascribed to it." Mr. Newman quotes a poet who says :—

"For them that are with newts, or snakes, or adders stung,
The seeking out an herb that's called Adder's Tongue,
As Nature it ordain'd, its own like hurt to cure,
And sportive did herself to niceties inure."

There is no great difficulty in cultivating this fern, if it be removed carefully without disturbing the roots,

PLATE XII.

ROYAL FERN (*Osmunda regalis*). See Page 83.



ROYAL FERN.

which should be dug up in a good quantity of their native soil, and then planted in loamy ground, and kept well watered and cool.

LESSER ADDER'S TONGUE.

OPHIOGLOSSUM LUSITANICUM.

(Plate XI. Fig. 5.)

OPHIOGLOSSUM LUSITANICUM is a small variety of the former species, not exceeding two or three inches in height, the tiny spike arising from its bright green leaves in the same manner. It may be recognised by its narrower frond and thicker (more fleshy) texture. The only British locality in which it has been found is the island of Guernsey, although it has long been known as a native of the South of Europe. It arrives at perfection in January. Its very early fructification and minute size suggest the cause of its being long overlooked in the spot where it is now found, and render it possible that it may also have escaped notice in other localities.

ROYAL OR FLOWERING FERN.

OSMUNDA REGALIS,

Linnæus, and generally adopted.

(Plate XII.)

THIS, the most stately of the British ferns, well deserves its name, and is, from its appearance, readily

distinguished from all others. Its flowery panicle crowns the otherwise leafy fronds, and rises three, or even four feet high, and sometimes attaining a height of eight or ten feet. In old plants the stem assumes the appearance of a trunk, and from the crown of this trunk grow the fronds, which are bipinnate; the pinnæ lanceolate or ovate lanceolate; the pinnules oblong and nearly egg-shaped. They are somewhat ear-shaped at the base, and mostly opposite. The upper portion of the frond is so densely covered with the brown clusters of capsules as to look like a spike of small flowers. The barren frond is entirely leafy. The plant appears in May, and is matured in August, but is destroyed by the early winter frosts.

This beautiful fern is to be found in most marshy, boggy situations throughout Britain. It is extremely abundant and luxuriant in some parts of Ireland, and at Killarney assumes a pendulous form, fringing the river between the lakes, and forming a prominent feature in the lovely scenery of that district. It is said that when Sir Walter Scott visited this far-famed district, he appeared but little interested in the scenery until coming upon the spot where the water is fringed by these magnificent ferns, he exclaimed, "This is worth coming to see." In the northern counties of England, the *Osmunda* is not uncommon. In the bogs of Lancashire it is frequently seen, and in the southern counties it is very plentiful. Old Gerarde knew of its existence near Brentwood, and when

describing its stem, which, on being cut through, exhibits a whitish centre, he calls it the "Heart of Osmund the Waterman," referring to a tradition existing, that a waterman of this name, dwelling at Loch Fyne, on one occasion bravely defended his family from the cruel Danes, and sheltered them among the tall branches of this magnificent plant.

The medicinal properties of the Flowering Fern are extolled by old writers as having "all the virtues mentioned in other ferns, and is much more effectual than they both for inward and outward griefs, and is accounted good in wounds, bruises, or the like. The decoction to be drunk, or boiled into an ointment of oil as a balsam or balm; and so it is singular good against bruises and bones broken or out of joint." The root, when boiled, yields a sort of mucilage, which, in the North of Europe, is used for stiffening linen.

This showy and attractive fern should find a place in all collections. It is not difficult of culture, and thrives well on the margin of a piece of water, or on rock-work near water. On the banks of ponds or lakes, and in a damp peaty soil, with plenty of moisture, it will attain its natural luxuriance.

Mr. Ward, the inventor of the closed plant cases, and the cultivator and lover of ferns, so arranged an artificial watercourse, in his little garden at Clapham, as to grow *Osmunda regalis*, and other bog plants, with great success.

COMMON POLYPODY.

POLYPODIUM VULGARE,

Linnæus, Bentham, and Moore.

(Plate XIII.)

SYNONYM.

Ctenopteris vulgaris, Newman.

THE generic name of this fern is formed from two Greek words, signifying *Many-footed*, on account of the many rootlets thrown out from the caudex.

It is one of the commonest and best known of our British ferns. It has thick woody creeping roots. The fronds are about six inches to a foot in height: they are always pendent in maturity, broadly oblong, lanceolate in their general outline. The fructification is very conspicuous, and usually at the upper part of the frond, in large circular patches of a golden colour. It is somewhat parasitic in its habit, growing on old trees and on walls and moist rocks.

It is a very generally common fern throughout Great Britain and Ireland, and in Europe, Russian Asia, and North America. Just as the Common Brakes seem to shun the habitation of man, so does the Polypody seem to flourish most in his vicinity, establishing itself on church towers, cottage roofs, and old walls. It especially delights in decaying trees, and may often be seen crowning some perishing trunk with a coronet of green waving leaves—

“A gilded halo hovering round decay.”

PLATE XIII.

COMMON POLYPODY (*Polypodium vulgare*). See Page 86.



COMMON POLYPODY.

Like our Common Brakes and many other ferns, the Common Polypody contains a large quantity of potash, which caused it to be used in former days by glass manufacturers. It had also a reputation as a medicine, its mucilaginous nature recommending it in pulmonary diseases. In Paris, even now, it is used as a domestic remedy for colds and coughs. Mr. Newman says he has seen women collecting it in Herefordshire as a specific in whooping-cough. It is gathered in October and November, when full of seed: the barren fronds are rejected. It is then hung up in the cottages to dry, and when required for use, is slowly boiled with raw sugar. The poor people call it "Maiden's Hair," or "Golden Locks." The ancient reputation of this species of Polypody is very curious. Pliny says that it is good for chaps on the toes, and also recommends the root dried and powdered to be snuffed up the nose, to consume a polypus. It is doubtless the "rheum-purging polypody" of Shakspeare.

The foreign species of *Polypodium* are much larger than our own; and in the South Sea Islands there is one which is called by the natives "Pigs-god," and is the presiding deity of these animals.

Dr. Joseph Hooker mentions that, during his residence in India, he frequently partook of shrimp curry, into which the young tops of the common *Polypodium* entered.

This fern well repays any trouble that may be

bestowed upon it. Care must be taken in its removal not to break the fibrous roots, which become entangled with the substances around them. In a greenhouse, or large case suspended in a wooden basket, well covering the roots with moss and leaf-mould and sand, it forms a beautiful object. Out of doors, too, it is a pleasing addition to the rockery, or stumps of old trees. It does well for bouquets, as it will live a long time in water.

ALPINE POLYPODY.

POLYPODIUM ALPESTRE,

Koch, Spurgel, Moore, and Bentham.

(Plate XIV. Fig. 1.)

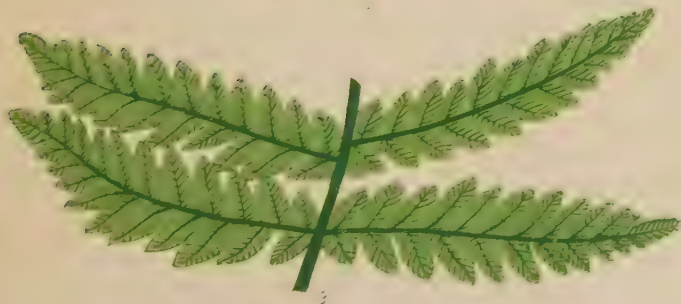
SYNONYM.

Pseudathyrium alpestre, Newman.

THIS fern bears so great a resemblance to *Asplenium Filix Fœmina*, that it has frequently been overlooked, and considered merely a variety of that fern. The fructification is, however, very different from that of the Lady Fern; and it has a short, thick, erect, tufted caudex, forming several crowns. The fronds are from a foot to a foot and a half high; they are lanceolate, twice pinnate; the segments numerous, sharply toothed; and the leafy portion continues almost to the base of the scaly stalk. The fructification is on the back of the frond, occupying about two-

PLATE XIV.

1. ALPINE POLYPODY (*Polypodium alpestre*). See Page 88.
2. OAK FERN (*Polypodium Dryopteris*). See Page 89.
3. BEECH FERN (*Polypodium Phegopteris*). See Page 92.



1. ALPINE POLYPODY.

2. OAK FERN.

3. BEECH FERN.

thirds of the upper portion of its length. The sori are small, circular, distinct, but become confluent in maturity. There is usually no indusium, but in some specimens there appears to be an abnormal development of a membrane covering the sori. The fronds are annual, and perish early in the autumn.

It is only lately that this fern has been added to our British Flora, and as yet has only been found in the Highlands of Scotland, where it grows in the greatest profusion, particularly in Forfarshire.

It is a fern which does not generally flourish well in artificial circumstances. Free air and shade, with a pure atmosphere, seem essential to it, and it is therefore not desirable to inclose it in a glass case or greenhouse, but rather to imitate its natural conditions as much as possible.

OAK FERN.

POLYPODIUM DRYOPTERIS,

Linnæus, Bentham, and Newman.

(Plate XIV. Fig. 2.)

SYNONYMS.

Gymnocarpium Dryopteris, Newman.

Polystichum Dryopteris, Roth.

THIS is one of the most delicate and elegant of our species of ferns. The roots are creeping, fibrous, and black, forming a dense, matted mass. The young fronds make their appearance in March and April, as

Mr. Newman expresses it, "Each at first resembling three little balls on wires." These balls gradually unfold, and display the triple character of the frond. They soon arrive at maturity, and are often loaded with fruit as early as June: they disappear in the autumn. The stem is very slender, purple, and shining, and is frequently twice as long as the frond. There are a few scattered scales towards the base. The fronds are slender and delicate, broadly triangular or rhomboidal, with three branches; the divisions pinnate; the pinnæ cut into segments nearly to the mid-rib; the uppermost entire. The colour is a brighter green than almost any other British fern, which, however, it is apt to lose if too much exposed to the sun. The sori are borne on the margins of the segments.

This pretty and delicate fern occurs chiefly in wild mountainous districts, wet woods, and the vicinity of waterfalls, in our northern English, Welsh, and Scotch counties. In Ireland it is a fern of great rarity. Throughout Europe it is very generally distributed.

This is peculiarly a shade-loving fern. Besides the delicate texture and graceful habit, the vivid green hue of its foliage is its great attraction, and cannot be preserved in exposed situations. Although a free supply of moisture is recommended, care must be taken that it does not remain stagnant, as it will speedily destroy the plant by the decay of the

rhizoma. By care and attention to these facts, this beautiful little fern will be found a pleasing and satisfactory addition to a fernery. From its small size, it is well suited for a fern case.

VARIETY.

POLYPODIUM CALCAREUM, or the Limestone Polypody (known also as *Polypodium Robertiana*), appears to be merely a variety of the Oak Polypody, of stouter growth, and occurring in limestone districts. Its chief distinctions consist in the pinnate rather than the ternate divisions of the fronds, which have a glandular, mealy, or tubescant appearance. In development, the fronds never assume the appearance of the three little balls, as in *Dryopteris*. It is of a darker duller green; its stalk is more scaly at the lower part—green instead of purple, and the clusters of sori more densely crowded. It is found commonly in Derbyshire, near Matlock, and abundantly in Cumberland, Westmoreland, Yorkshire, and Lancashire. It does not seem to have been found in Scotland or Ireland.

The mealy dust which characterises this fern is a beautiful object under the microscope, each slender stem supporting a globular head; but as this appearance soon goes off when the specimen dries, it is best to examine freshly-gathered plants.

There seems to be no great difficulty in cultivating this fern in the ordinary soil of gardens, although it

does not thrive so well as some others in the atmosphere of towns. When grown in the greenhouse, it should be planted in large pans, with a free admixture of limestone and crumbled and sifted mortar; full exposure to the sun has rather a beneficial effect on it than otherwise.

BEECH FERN, OR PALE MOUNTAIN POLYPODY.

POLYPODIUM PHEGOPTERIS,

Linnaeus, Bentham, and Moore.

(Plate XIV. Fig. 3.)

SYNONYMS.

Polystichum Phegopteris, Roth.
Lastrea Phegopteris, Newman.

| *Gymnocarpium Phegopteris*, New-
man (B. Ferns).

THIS is a delicate plant, and disappears with the first frosts of the autumn. It has a slender creeping scaly stem, with black fibrous roots. The fronds appear in May, and are about six inches to a foot long. The stipites are generally twice as long as the leafy part of the frond, and are fleshy and very brittle. The fronds are triangular, extended into a long narrow point at the top: they are pinnate only at the base. The lower pair of pinnæ droop downwards, the rest grow in an upward position. The mid-rib, principal veins, and margins of the frond, are more or less hairy on the under side; by which this species may be

distinguished from the smaller specimens of Marsh Shield Fern, which it resembles. The sori are small, almost at the margins of the lobes.

This fern delights in wild and mountainous districts, wet woods, and the vicinity of waterfalls. In the vicinity of the falls of Lodore, celebrated in song by the poet Southey, this fern is to be seen glistening with drops of spray from the water, which there comes

“Dashing and flashing, and splashing and clashing,
And so never ending, but always descending,
Sounds and motions for ever and ever are blending,
All at once and all o’er, with a mighty uproar,—
And this way the water comes down at Lodore.”

It is rather limited in its range, occurring, however, in England to the southward, westward, and northward ; but appears to be entirely absent from the large midland and eastern tract. In Scotland it is not uncommon, but is rarely found in Ireland. There is no authority for its specific name of *Beech* Fern, as it is not found to grow especially around or near that tree, nor is there any likeness in it to the foliage of the *Beech* tree.

This is an elegant little species of fern, and grows freely, requiring but few conditions, excepting shade and freely-percolating moisture. It is well adapted for planting out on rock-work and old stumps of trees.

BRAKES OR BRACKEN—EAGLE FERN.

PTERIS AQUILINA,

Linnæus, Smith, Hooker and Arnott, Babington, Bentham, and Moore.

(Plate XV. Fig. 1.)

SYNONYM.

Eupteris aquilina, Newman.

A WELL-KNOWN and very common species of fern, not at all difficult to recognise, by its large and strong growth, and the continuous lines of marginal sori on the compound bipinnate fronds. They are sometimes ten or twelve feet in height, and their texture is crisp and brittle. Each frond appears singly, and the growth of the plant is the reverse of being tufted. The root attains a very large size in a favourable soil, and Mr. Newman says he has found them buried as low as fifteen feet. The plant spreads very rapidly, and in some places acres of land are covered by it. The fronds turn brown at the first approach of frost, and decay away in the winter. The stem being hard and tough, and deeply buried in the earth, is not easily rooted up; but when cut across, presents on the two divided surfaces the figure of an *Oak Tree*, or as some fancy, a *Spread Eagle*; hence its specific name.

Although one of our commonest ferns, this plant is not luxuriant on chalky soil, but in sandy and stony districts it is most abundant, and by its handsome

feathery fronds and rich green appearance, adds greatly to the scenic effect of many a rural district. It forms a hiding-place for game ; and the fern-coverts are well known to sportsmen, and are celebrated in song :

“The wild buck bells from ferny brake.”

The economical uses of this fern are many. As a manure it is largely consumed in some places ; and in the western parts of Scotland is a profitable source of alkaline ashes for the glass and soap-maker. As a litter for horses, it is in great request in some parts of Wales, Ireland, and Scotland. The stalks are used as materials for thatching, and this seems to be a very ancient practice,—as early as the year 1349. In the Forest of Dean, pigs are fed on the fronds. A botanical friend of our own, rather given to speculative devices, sent us one day a dish, consisting of the lower parts of the stem of this fern, cut off just below the ground, so as to retain the white delicate appearance of underground growth, assuring us it was quite equal to asparagus. It was accordingly cooked, and served as seakale or asparagus, and pronounced to be quite palatable, though not equal to either of the other named vegetables. It might, however, well form a substitute for them, and, being so easily and inexpensively obtained, it is surprising that it does not oftener find its way to the poor man's table. The astringency of this fern is great, so much so that it

has been recommended for dressing and preparing chamois leather. As a material for packing fruit, &c. it is invaluable. This plant was undoubtedly the original *fearn* of our Saxon ancestors, from the abundance of which the names of so many towns and villages have originated ; such as Farnborough, Farnham, &c. It is to this fern we may attribute chiefly the many superstitions, legends, and proverbs connected with ferns generally. It seems to have been associated with our popular fancies for many a long day. Shakspeare speaks of the “fern-seed by which we walk invisible.” Ben Jonson says :

“I had no medicine, sir, to walk invisible,—
No fern-seed in my pocket.”

There was a homely proverb, once in common use, which we may quote :

“When the fern is as high as a spoon,
You may sleep an hour at noon ;
When the fern is as high as a ladle,
You may sleep as long as you're able ;
When the fern begins to look red,
Then milk is good with brown bread.”

The beauty and pleasant associations of this luxuriant fern are celebrated in song by a modern poetess, who says, in her appropriate lines,—

“Have ye to learn how the Eagle Fern
Does in its heart enshrine
An oak-tree, like that which the hunter Herne
Haunted in days ‘long syne’ ?

PLATE XV.

1. BRACKEN (*Pteris aquilina*). See Page 94.
2. CÔMMON HART'S TONGUE (*Scolopendrium vulgare*).
See Page 97.
3. ROOTING BRISTLE FERN (*Trichomanes radicans*).
See Page 100.



1. BRACKEN.

2. HART'S TONGUE.

3. ROOTING BRISTLE FERN.

“An oak-tree small is repeated, all
 Complete in branch and root,
 Like the tree whereunto King Charles did flee,
 When press'd by hot pursuit.”

From its large and rapid growth, the depth of soil required for its roots, and the amount of space necessary, this fern is scarcely adapted for an ordinary fern collection, although there are positions where it is very ornamental; such as in shrubberies, in parks, and paddocks. It is not difficult to transplant, if only care be taken that the large long rhizome be not injured in removal, which had better take place in the winter. Any soil is indifferent to its success, so that it be not chalky.

COMMON HART'S TONGUE.

SCOLOPENDRIUM VULGARE,

Symons, Smith, Benthams, Hooker and Arnott, and Moore.

(Plate XV. Fig. 2.)

SYNONYMS.

<i>Phyllitis Scolopendrium</i> , Newman.	<i>Scolopendrium officinarum</i> , Swartz.
<i>Asplenium Scolopendrium</i> , Lin-	<i>Scolopendrium Phyllitis</i> , Roth.
næus.	

THIS is a readily distinguishable species of fern, and is very graceful and beautiful, contrasting, as it does, with the feathery appearance so common in other ferns. It grows in tufts; the fronds, which are evergreen, are oblong, strap-shaped, and simple: they vary in length from six inches to a foot and a half. At first they appear erect and stiff, but afterwards

assume a pendulous habit, spreading out in a circular manner from the clumps of roots which are so well known in every rural district. The sori are arranged at short intervals on the upper portion of the frond, in the direction of the veins. The name of this species is an alteration of *Scolopendra*, or Centipede, from a fancied resemblance between the feet of the centipede and the arrangement of the sori. It attains perfection in July and August, and remains green all the winter. The difference of circumstances, especially in cultivation, causes such changes in the appearance of this plant that many varieties have been described; but few are, however, permanent, or require special notice. *Scolopendrium crispum*, *Scolopendrium polychides*, *Scolopendrium multifidum*, and *Scolopendrium lacertum* are those we have thought most permanent, and likely to be met with.

Some forms of this fern are viviparous, or have buds separating from the stem and growing spontaneously.

The Hart's Tongue and its varieties are commonly found on shady banks, in the clefts of old rocks, and about old buildings throughout Great Britain; though not so frequently in Scotland as elsewhere. In the Isle of Wight it grows luxuriantly, and in the woody spots between Ventnor and Niton may be seen in perfection. It delights in underwoods and shrubberies; and the large handsome tufts consist of fronds arching from the centre, like the long feathers of a cock's tail.

Being an evergreen, and a plant of free growth, the Hart's Tongue is one of the most desirable hardy ferns for open rock-work. It will do in any part of it, either on level ground or on rocks by the sides of streams, where its fronds can hang over the water. In this situation it is a beautiful object. It requires a great deal of water at the roots during the growing season, and delights in shade and moisture, although it will live under the disadvantages of exposure and heat.

It was formerly in repute as a medicine. Ray speaks of it as an astringent, and of its healing powers when applied to ulcers and wounds. In the 'Phytologist' it is mentioned that the late Lady Greenly, of Titley Court, Herefordshire, took great pains to cultivate an evergreen fern as a remedy for burns, which turned out to be the common Hart's Tongue.

VARIETIES.

SCOLOPENDRIUM VULGARE CRISPUM differs from the common Hart's Tongue in the wavy curled appearance of the frond at the margin ; so that it has the effect almost of a file on each side the mid-rib. It is often, too, of a more delicate texture and paler green colour.

SCOLOPENDRIUM VULGARE LACERTUM is a dwarf and highly ornamented fern ; the fronds are often as broad as long ; they are deeply lobed or pinnatifid. It was found on a wall near Taunton.

SCOLOPENDRIUM VULGARE POLYSCHIDES, or ANGUSTIFOLIUM of some authors, has a narrower linear frond, blunt at the apex, deeply and irregularly cut at the margin into roundish lobes. The sori are arranged in two irregular lines on each side the mid-rib.

In 'Nature-Printed Ferns,' Professor Lindley and Mr. Moore have described sixty-six varieties of *Scolopendrium*; the distinctions are in many cases, however, so small as to be scarcely recognisable.

SCOLOPENDRIUM VULGARE MULTIFIDUM has the fronds forked, either near the apex or sometimes near the base. They are strap-shaped below, and then cut out into irregular fan-shaped expansions at the top. Sometimes they are cut into more acute lobes, and it is then known as *Scolopendrium lobatum*.

ROOTING BRISTLE FERN.

TRICHOMANES RADICANS,

Swartz, Hooker, Babington, Newman, and Bentham.

(Plate XV. Fig. 3.)

SYNONYMS.

<i>Trichomanes brevisetum</i> , Brown and Smith.		<i>Trichomanes speciosum</i> , Euro- peum, pyxidiferum, and alatum of Authors.
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THIS beautiful fern exists only in the close vicinity of water. It is of a semi-membranous texture. The

fronds are three or four times pinnatifid; the segments alternate, linear, entire, or two-clefted and obtuse. The fronds are from six to eight inches high, including the rather long stalk. The root is very fibrous and creeping, as is the stem, which is wiry, black-looking, and clothed with pointed scales. The seed-cup in the fertile frond takes the place of a fork of the pinnule, having a hair or spike projecting from the centre.

This exceedingly beautiful and delicate fern is found only in Ireland, though it is said to have grown in Yorkshire. The Turk Waterfall, near Killarney, is the most celebrated locality for it; where, amidst the dripping rocks and the spray of the water, it forms a verdant drapery most charming to behold; but there are other stations in Ireland where it is found by botanists. At Blackstones, in the county of Kerry, it was discovered by two gentlemen, growing in a wild and romantic cave, the rocky walls of which had been for ages covered with its overlapping fronds, forming a mass of the loveliest green; strongly contrasting with the darker and more sombre hue of the Killarney plant. This pretty fern is abundant in the island of Madeira, and is found in the West Indies and the islands of the North Atlantic.

From its peculiarly membranous texture, and moisture-loving nature, there have always appeared to be difficulties in the way of the cultivation of this fern. Mr. Ward's invention, however, has removed all

these objections, and this beautiful fern is peculiarly successful in his closed cases. In his little book he gives interesting particulars concerning his experiments with this delicate little fern, and his perfect success in overcoming apparent difficulties.

He was induced to commence his experiments with this fern on account of its intractable nature under ordinary methods of culture. Loddiges, the celebrated nurseryman, could never keep it alive; and Mr. Ward relates that Baron Fischer, the superintendent of the botanical establishments of the Emperor of Russia, when he saw the plant growing in one of his cases, took off his hat, made a low bow to it, and said, "You have been my master all the days of my life." Mr. Ward thinks the difficulties in cultivating this fern arise solely from a dry atmosphere and the presence of adventitious matters. With him it lived for four years in a wide-mouthed bottle, covered with oiled silk, during which time it required no water; but having outgrown its narrow bounds, it was removed to some rock-work, in a fern-house, covered with a bell-glass, and occasionally watered. Here it produced fronds one-fourth larger than any native specimens from Killarney or elsewhere. Mr. Ward recommends that the rhizomes of this fern should be planted in a case, or under a bell-glass, and the fronds sprinkled with water two or three times a week in summer, less frequently in winter, keeping the door of the case always shut, a drainage-valve at the

bottom always open. A subdued light, coming through tinted glass or coloured muslin, is desirable. In a case suited to *Trichomanes* it is unlikely that any other fern will thrive, unless it be *Asplenium marinum*.

OBLONG, OR RAY'S WOODSIA.

WOODSIA ILVENSIS,

R. Brown and Bentham.

(Plate XVI. Fig. I.)

SYNONYMS.

Acrostichum ilvense, Linnaeus. | *Polypodium aroonicum*, Withering.
Polypodium ilvense, Swartz.

A DECIDUOUS species of fern, dying down to the ground in the winter and appearing again in the spring. The root-stalk is densely tufted; the fronds spreading two to four, or rarely six inches long. Their form is lanceolate, more or less broad, and in their mode of dursion they are pinnate; the pinnæ opposite, in pairs, of an obtusely oblong shape, with a deeply lobed or pinnatifid margin. They are of a thick dull-looking texture, hairy above, and clothed underneath with brownish bristle-like scales, among which the sori are almost concealed.

This is one of our rarest ferns. It grows on elevated and bleak places, in the fissures of rocks, in Wales and Scotland, and in some places in the north of England. It is spoken of by John Ray as being

found on Snowdon, and is well known by the guides of that district as growing there.

This little fern is said to do well in a fernery, in a sheltered part, but it must not be kept very wet. Neither this species nor its variety seems to bear confinement in closed cases or frames, as they require a free circulation of air, without which they become feeble and die.

VARIETY.

WOODSIA ILVENSIS HYPERBOREA, or Alpine Fern, called by Newman *Woodsia alpina*, although considered as a distinct species by some writers, does not differ so materially from *Woodsia ilvensis* as to constitute more than a variety. It is known by its narrower fronds, being of a thinner texture, less hairy and scaly; while the pinnæ are less opposite, and shorter, and more triangular in their general outline.

It is a very rare species, found in the fissures of Alpine rocks, mostly in places little visited.

LYCOPODIUM.

THERE are certain families of plants more closely allied to the ferns than to any other group, and it seems only right to mention them in a book on British Ferns, so that they may be recognised, and their relationship easily ascertained by the young

PLATE XVI.

1. RAY'S WOODSIA (*Woodsia ilvensis*). See Page 103.
2. COMMON CLUB MOSS (*Lycopodium clavatum*).
See Page 105.
3. MARSH CLUB MOSS (*Lycopodium inundatum*).
See Page 107.
4. SAVIN-LEAVED CLUB MOSS (*Lycopodium alpinum*).
See Page 107.
5. FIR CLUB MOSS (*Lycopodium selago*). See Page 108.



1. RAY'S WOODSIA

2. COMMON CLUB-MOSS.

3. MARSH CLUB-MOSS.

4. SAVIN-LEAVED CLUB-MOSS.

5. FIR CLUB-MOSS

student of Cryptogamic botany. The *Lycopodiums* are associated in the minds of most who have not given attention to their structure, with the beautiful bright green club moss, so common in our conservatories and of such luxuriant growth, ordinarily known as *Lycopodium*. It is a foreign species and is not a *Lycopod* at all, but belongs to the *Selaginellas*. The British species of *Lycopods* are six in number only, and are not difficult to recognise. Originally the *Selaginellas* were included under the *Lycopods*, but they have been separated on account of the difference in their spore-cases.

COMMON CLUB MOSS, OR WOLF'S CLAW.

LYCOPODIUM CLAVATUM,

Linnaeus.

(Plate XVI. Fig. 2.)

THIS is the most common of our British club mosses, creeping along the ground of our hills and moors. Its roots run along for many feet and interlace so as to form almost a perfect knotted sort of carpet. It is widely dispersed throughout Europe, and in Sweden the peasants weave door-mats from its stems and call it matted grass.

The stems throw out pale wiry roots at short distances, which attach the plant firmly to the earth. The narrow leaves, each ending in a long hair, are

turned inwards and overlap each other, adhering closely to the stem. The branches spring up in tufts, and generally bear a pair of cones, sometimes one, and occasionally three. These cones are covered with little bracts, in the axils of which the capsules lie concealed. When the seed is ripe the capsules burst, the bracts turn back, and the cones assume a dishevelled appearance.

Pretty ornaments are formed of this plant by rustic belles and beaux, and Linnæus describes how the boys in Lapland weave it into crowns, and Tragus mentions the same custom in Germany. The fireworks for which districts in Persia were long ago renowned, were indebted, it is said, to this plant for the wonderful effects produced. Olearius says the sudden appearance and disappearance of brilliant flames is caused by the use of "Russian Planu," a yellow dust beaten out of the "Beerlap, or Devil's Claw." His description of this plant exactly tallies with that of our Wolf's Claw, and the idea that he referred to this plant is confirmed by the fact that Sir J. E. Smith tells us that this dust is still used in Germany to produce artificial lightning on the stage. It is said to have a healing property when applied to the skin, and to be a remedy for the dreadful disease known as *Plica Polonica*, which exists chiefly in Poland.

It will grow in a conservatory or closed case if the soil be composed of sandstone with a substratum of peat earth, and the branches be well pegged down.

MARSH CLUB MOSS.

LYCOPodium inundatum.

(Plate XVI. Fig. 3.)

THIS species has also creeping stems and short slightly branched roots. It has but one solitary spike. The leaves are narrow, pointed, and entire at the margin. The bracts are broad at the base, extended into an awl-shaped point with one sharp tooth on either side. The capsules are spherical. It is found on marshy ground, on heaths and commons, and dies down in the winter, all except the point of the stem; the whole plant turns black and looks as if it were burnt. As spring comes on, it begins to grow and sends up one dense leafy branch with a large cone on the top of it as long as the branch itself. The species is found in North America and temperate Europe.

SAVIN-LEAVED CLUB MOSS.

LYCOPodium alpinum.

(Plate XVI. Fig. 4.)

THE specific English name of this Club Moss is due to its resemblance to the branches of the Savin tree — *Juniperus Sabinus*. Its stem creeps along the ground and is usually hidden by the sward; the

clustering branches rise from it at short distances, their bluish-green or glaucous hue and plentiful forks making them attractive objects. The leaves fold closely over each other and are arrayed in four rows, thereby giving a sort of square appearance to the branches. Sir W. Hooker says he saw stacks of this plant in Iceland, stored away to be used as a yellow dye for woollen goods. It grows abundantly on hill-sides in Scotland and the north of England, and in most of the northern countries of Europe.

FIR CLUB MOSS.

LYCOPodium SELAGO.

(Plate XVI. Fig. 5.)

THIS curious plant resembles in appearance the young state of the Norfolk Island and other pines. It is of a very tough, hard, unyielding nature, and suits well the bleak and desolate situations in which it is usually found. The branches are thick, clustering, and forked, the leaves firm, rigid, and of a dark yellowish-green colour. The fructification is situated in the axils of the upper leaves, and contained in capsules of a kidney shape. The Highlanders use it instead of alum to fix colours in dyeing, and an infusion of it is sometimes taken as a medicine, but it is very powerful and somewhat dangerous.

ISOETES

THE Quillwort family or *Isoetes* contains but two British species. They are very unlike any other of the Fern group, and some botanists reject them altogether, but their fructification induces Hooker and some other authors to admit them at all events as very close allies.

They are more or less aquatic plants, often found at the bottom of lakes, making a sort of submerged sward.

QUILLWORT OR MERLIN'S GRASS.

ISOETES LACUSTRIS.

THIS was long considered to be the only native species. It has erect, stout, cellular leaves, the roots are two or three inches in length, sometimes branched, and nearly transparent ; these spring from the tuberosous caudex, the crown of which bears the awl-shaped brittle, evergreen leaves.

DURIEU'S QUILLWORT.

ISOETES DURIÆI.

IT is only lately that this species has been recognised by botanists as truly native. Its true British habitat

is Guernsey, where it was discovered growing wild by Mr. George Wolsey in 1860.

The leaves are not thick and erect, but slender and much curved. It grows in the lakes of Cumberland and Westmoreland, and is often collected there by tourists and botanists.

COMMON PILLWORT.

PILULARIA GLOBULIFERA.

THE name of this plant comes from *pilula*, a little pill, from its curious globular fructification. Its stem creeps along the watery ground and bears its fruit very near the soil. The leaves rise from the caudex; in their early stage curled like the fronds of ferns. They are awl-shaped and bright green in colour. The little capsules, about the size of peppercorns and covered with brown hairs, contain the two kinds of fruit, and are always at the lower part of the stem. The plant is found all over the United Kingdom and is plentiful in the South. It flourishes all over Europe, and also in Western Australia.

HORSETAILS.

EQUISETACEÆ.

THE name of this family of plants is derived from the two words, *equus*, a horse, and *seta*, a hair or bristle,

thus corresponding with the popular name borne by the species throughout Europe. Sir William Hooker describes nine species as native in Britain, and some of them are pretty though curious-looking plants. They are leafless and have stems divided by points, each of which terminates in a toothed sheath. The fructification is contained on capsules arranged in cones. The outer skin of the stems abounds in flinty particles, placed in rows which form ridges up the stem. The hollows between these ridges contain minute openings or stomata. This group of plants carries us back in thought to the days of the early world when the earth was peopled by the strange monsters whose history is written on their rock-entombed bones and clothed with a vegetation of which these Horsetails are the type. At that period of the world's history they grew as trees, and formed shelter for the huge beasts whose forms are only known to us by their remains, such as the Sauroids, and the mighty Plesiosaurus, and Megalosaurus, of which we read in geological records. Even at the present time many of these plants which we see here only in their diminutive size, attain in the climate of Brazil and other warm regions a height of fifteen or eighteen feet and a diameter of six or seven inches. The stems of our British species of *Equisetacæ* contain so much flinty matter that they are still used in many parts of the country as scouring paper to clean brass and wooden vessels. Formerly no comb-maker, metal

worker, or cabinet-maker could complete his work without "Dutch rushes" as these horsetails are called, to polish it, and even now large quantities are imported from the marshes of Holland for this purpose. The presence of the siliceous substance so valuable in the stems of these plants can readily be seen under a microscope, and a very favourite object for display is a section of one of these stems, in which the *silex* may be observed arranged with the utmost regularity along the longitudinal ridges. Sir David Brewster shows that each fragment of this material is possessed of an "axis of double refraction."

It seems strange that plants of so rough and rigid a nature as these should be used as human food, but such is nevertheless the case. Haller tells us that the Romans were in the habit of eating the great Horsetail, and another more modern author says that "the young buds are dressed by some like asparagus, or, being boiled, are often strewed with flour and fried, being considered a delicacy." Gerarde recommends them in a bruised state for the cure of wounds, and tells us that the juice may be drank in order to stop bleeding of the nose. It is not improbable that they may contain some slight astringent properties, and with this view Tragus advises the expressed juice to be applied to recent and bleeding wounds and to be taken internally as an astringent.

GREAT WATER HORSETAIL.

EQUISETUM TELMATIGÆ.

THIS is the finest of British Horsetails. It has barren and fertile stems. The former sometimes attain the height of six or seven feet, and have an erect and stately appearance by the banks of rivers and streams. They are clothed from the summit to near the base with whorls of crowded branches, from thirty to forty in a whorl. The stems are thick and smooth, and the numerous ribs are very slight. The sheaths are close fitting, divided at the margin into slender teeth, the same in number as the ribs of the stem, and the branches in the whorl. Each branch is from eight to ten inches long, and is jointed.

The colour of the whole is of a pale green. The fertile stem is much smaller, and seldom grows more than a foot in height; very stout, destitute of branches, divided into about fifteen joints, and covered with large, loose, pale sheaths with long slender teeth. The cones are very large, often $2\frac{1}{2}$ inches long and $1\frac{1}{2}$ in circumference; the scales are very numerous and the capsules attached to them arranged in whorls. The presence of silicic acid has been observed in this plant by chemists, due to the combination of a silicate with an acid known as equisetetic acid.

BLUNT-TOPPED HORSETAIL.

EQUISETUM UMBROSUM.

THIS Horsetail has stems of three kinds. The barren stem has from eighteen to twenty sharp ridges, rough, with prominent flint particles ; its sheaths are small, about twenty in number. The branches are as many, spreading widely, and jointed. The fertile stems are about six inches high and have numerous joints, with large pale-coloured sheaths almost covering the stem ; the cone is oval, chestnut-coloured, the capsules white. The third kind of stem is of a size intermediate between the other two, less branched than the barren stem, and bearing a small cone. It is a somewhat rare plant, but is found in the north of England, Scotland, and Ireland.

FIELD HORSETAIL.*EQUISETUM ARVENSE.*

THIS is the commonest of our Horsetails, and is very troublesome to the farmer, being difficult to eradicate and noxious to cattle, probably owing to the sharp points of a flinty nature in which it abounds. It grows chiefly on sandy soil, and is an agricultural pest in many places.

It is remarkable from its being the only British

species which has its fertile and barren stems positively and invariably distinct, the latter not appearing until after the former have fructified in the month of April.

WOOD HORSETAIL.

EQUISETUM SYLVATICUM.

THIS is really a handsome plant, which cannot be said for many of this group; its long drooping branches remind one of the form of some tropical cypress, and a mass of the plants growing together in our forests may be said to resemble a miniature grove of drooping larches. This Horsetail is sometimes called the "fairy larch," and is really a graceful and elegant little plant. Its stems are of two kinds, sterile and fertile; both appearing at the same time. The fertile stems are never green or branched when young, but remain after the maturity of the spike, and then throw off whorls of green graceful branches, lose their terminal catkins, and assume an appearance similar to the sterile stems, both flourishing together.

SMOOTH NAKED HORSETAIL.

EQUISETUM LIMOSUM.

THIS is a handsome plant, very frequently found in marshy places, ditches, &c. It presents the peculiarity of bearing its catkins on stems similar to the barren

ones. It is the only one of the group used as food for cattle. Linnæus says it is cut up and given to cows in Sweden, and that it increases the supply of milk. In Lapland the reindeer eat it greedily even in a dry state. Mr. Knapp, in his 'Journal of a Naturalist,' gives an account of a colony of short-tailed water rats who subsisted upon this plant. And as they fed upon its hard stems, the sound of them gnawing was heard at a great distance.

MARSH HORSETAIL.

EQUISETUM PALUSTRE.

THIS species has roughish stems and loose sheaths, the teeth of which are pale, wedge-shaped, and tipped with black. Both kinds of stems are sometimes branched, the branches numerous jointed, ascending, and with four or five ribs. The cones are oblong, an inch in length, stalked, and with many white capsules. It is very common in marshy places in Great Britain.

ROUGH HORSETAIL OR DUTCH RUSHES.

EQUISETUM HYEMALE.

THIS is *par excellence* the species of Horsetail which exhibits the peculiar structure of the family and which gives it its reputation as a siliceous vegetable production. It has simple stems, two to three feet

high, of a glaucous green colour, throwing simple branches from the base, very rough to the touch on the surface. It grows freely in marshy districts in Great Britain, but is cultivated in great quantities on the canal banks of Holland, from whence it is imported under the name of Dutch Rushes. It is of great value where it grows on account of the great length and interlaced growth of its root fibres, which mat together and consolidate the loose and swampy soil in which they grow, and thus form one of the most effectual water dams of the level land. An example of the development of the roots of *Equisetum* is afforded by the former species, *E. palustre*, which often fills up our drains and water pipes so completely with its fibres, as to interfere with land drainage very considerably in some places. The amount of flinty matter contained in the stems of this plant is very remarkable. The particles are arranged most curiously and beautifully in two lines parallel to the axis of the stem, and may be distinctly seen under the microscope. Dr. Brewster observed the remarkable fact that each particle has a regular axis of double refraction. In the straw and chaff of barley, oats, and rye, he noticed analogous phenomena, but the particles were arranged in a different manner, and displayed figures of singular beauty. It is this species, under the name of Dutch Rushes, that is used extensively as a polishing medium in the arts, either for bone, wood, or metal.

ROUGH-TOOTHED HORSETAIL.

EQUISETUM TRACHYODON.

THIS species bears great resemblance to the Dutch Rush, and Sir W. Hooker considers that it holds an intermediate place between that species and the Variegated Horsetail. The sheaths are pale greenish brown in growth, but ultimately become black, and the teeth are awl-shaped. It is a rare plant, being found chiefly in the north of Ireland and on the banks of the Dee.

VARIEGATED ROUGH HORSETAIL.

EQUISETUM VARIEGATUM.

THIS species of Horsetail is chiefly found on sandy places near the sea. The stems are freely branched just beneath the earth, so as to give them a tufted appearance. It is a dwarf plant, seldom growing more than a foot in height, sometimes less. The ridges on the stems are very prominent, the sheaths below pale green, ribbed and black above. The markings of the black ring of the upper part and the white margin to the teeth, with the pale green colour of the base, have gained for this species the name *variegatum*. Many botanists do not regard this as a distinct species, but only as a variety of the two previous ones.

GLOSSARY.

N.B.—In compound terms the first qualifies the second.

- ACUMINATE, tapering off to an acute point.
ADNATE, joined to that on which it grows by its whole breadth of foliage ; connected.
ADDRESSED, close to the stem.
ALTERNATE, branches or leaves succeeding each other interchangeably, first on one and then on the other side.
ANASTOMOSE, to run one into the other.
ANNULATE, ferns that have a ring round their seed-cases.
ANNULUS, the jointed ring of the seed-case.
ANTHER, the vessel containing the fertilising pollen at the top of the filament of the stamen.
ARISTATE, terminating in a bristle ; awned.
ARTICULATED, jointed.
ATTENUATED, growing gradually narrower ; tapering.
AURICLED, having a kind of ear-shaped projection.
AWNED, terminating in a bristle ; aristate.
AXIL, the angle formed by the leaf-stalk, or branch and stem.
AXILLARY, seated in the axil.
- EIDENTATE, twice-toothed.
BIFID, cleft in two.
BIPINNATE, twice-pinnate.
- CALICIFORM, like the calyx or cup of a flower.
CAPILLARY, fine thread- or hair-like.
CAUDEX, the part under or on the ground, from which the frond springs ; popularly the root ; to which the fibres or actual roots are attached.
CELLULAR, consisting of little cells or cavities.
CILIATED, fringed with minute hairs.

CIRCINATE, coiled inwards, like a watch-spring or a shepherd's crook.

CLAVATE, club-shaped, thinner at the base, and thicker upwards.

COMPOUND, composed of many parts or divisions.

COMPRESSED, a cylinder, more or less flattened.

CONCOLOROUS, of one uniform colour.

CONFLUENT, meeting or running together ; uniting.

CONNATE, joined at the base.

CONVOLUTED, rolled together ; curled inwards.

CORDATE, heart-shaped.

CORIACEOUS, leathery.

COTYLEDONS, the perishable side-lobes of the seed which furnish nourishment to the embryo plant.

CRENATE, }
CRENULATE, } notched, indented.

CRENATURES, notches ; indentations.

CROWN, the rounded top of the root projecting above the ground.

CRYPTOGAMOUS, plants whose reproductive organs are not apparent.

CUCULLATE, shaped like a hood, cowl, or bladder.

CUNEATE, wedge-shaped, widening upwards.

CYLINDRICAL, formed like a round tube.

DECIDUOUS, falling off.

DECOMPOUND, divided yet further beyond tripinnate.

DECURRENT, running downwards, as the base of a leaf down the stem.

DEFLXED, bending or curving downwards.

DEHISCING, bursting open.

DELTOID, trowel-, or triangular-spear-shaped.

DENTATE, toothed.

DEPAUPERATED, lessened ; contracted ; impoverished.

DIAPHANOUS, transparent.

DICHOTOMOUSLY, forked in two branches.

DIGITATE, like the human fingers.

DISTICHOUS, two-rowed or ranked.

DORSAL, on the back.

DORSIFEROUS, bearing seed on the back.

EVERGREEN, retaining its leaves during the winter.

EXANNULATE, ferns not having a ring round their seed-cases.

EXsertED, projected beyond the margin.

FALCATE, shaped like a reaping-hook.

FILIFORM, thread-shaped.

FLABELLIFORM, fan-shaped.

FLEXUOUS, winding ; crooked ; zigzag.

FROND, the main stem of a fern with its branches, &c.

FRUCTIFICATION, } the sori, spore-cases, and their appendages.
FRUIT,

FURCATE, forked.

GIBBOUS, bulged out.

GLABROUS, bald ; smooth.

GLAUCOUS, hoary grey-green, like the back of a cabbage-leaf.

GRUMOUS, thick ; clotted.

GYRATE, curled up.

HABITAT, the native home of a plant, where it grows indigenously.

HERBACEOUS, green and leafy.

HYBRID, a mixed plant, composed of two species.

HYBRIDISATION, the commingling or running of plants of different species one with the other.

IMBRICATED, laid one upon the other, like tiles.

IMMERSED, sunk.

INDECIDUOUS, retaining its leaves during the winter, whether changed in their colour or not.

INDUSIUM, the cover over the mass of spore-cases.

INVOLUCRE, used by some writers for indusium.

LACINATED, jagged.

LANCEOLATE, narrow, oblong, triangular above, and contracted again below ; lance-shaped.

LATERAL, springing from the side of the root, stem, &c.

LIGULATE, strap-shaped, like the blade of a paper-cutter.

LINEAR, very narrow, with the two sides parallel.

LOAM, earth composed of chalk and clay.

LOBE, scalloped portion of the leaf between its divisions ; or leaf itself, or branch, when not cut down quite to the stem ; sometimes used for perfect leaf.

LOBED, divided more or less deeply down into scallops, or parts rounded at their edges.

LUNATE, crescent-shaped.

MEMBRANEOUS, } semi-transparent, and of the texture of skin, or
 MEMBRANOUS, } very thin parchment (membrana).
 MEMBRANACEOUS, }

MIDRIB, the main ridge or fibre running down the centre of the whole leaf.

MONOPHYLLOUS, single-leafed, undivided; entire.

MONSTER, an anomalous variety.

MUCRONATE, ending abruptly in a sharp point.

OBOVATE, egg-shaped, the small end downwards.

OBSOLETE, contracted; indistinct; imperfect.

OPPOSITE, springing from the same level on both sides of the stem.

ORBICULAR, round; globe-shaped.

OVATE, egg-shaped, large end downwards.

PALEACEOUS, chaffy; husky.

PANICLE, an irregular bunch of flowerets.

PECTINATE, apart, like the teeth of a comb.

PEDICEL, a little leaf-stalk.

PEDICELLATE, having a little leaf-stalk.

PELTATE, target-shaped.

PENTAGONAL, five-angled or cornered.

PERSISTENT, abiding in leaf during the winter.

PETIOLE, leaf-stalk.

PETIOLED, } stalked.
 PETIOLATED, }

PHÆNOGAMOUS, plants whose flowers are apparent.

PINNA, the lateral offshoot from the main stem.

PINNATE, having lateral offshoots distinctly cut down to the stem.

PINNATIFID, having incomplete branches or leaves, their divisions not reaching down to the stem.

PINNULE, the leaf on a branch.

PISTIL, the centre organ in the interior of a flower or blossom.

POLLEN, the fecundating farina in the anther of the higher plants.

PROCUMBENT, lying down along the ground; not springing upwards.

PUBESCENCE, down, or woolly hair.

PUBESCENT, clothed with soft wool, down, or hair.

QUADRATE, squared.

RACEME, a bunch of irregular flowerets.

RACHIS, the main stem from the branches upwards; sometimes used for the whole stem; secondary or partial, the same correspondently on the branches.

RECEPTACLE, the portion of the veins to which the spore-cases are attached.

RECURVED, }
REFLEXED, } turned or curved back.

RENIFORM, kidney-shaped.

RETICULATED, of fine net-work texture.

RHIZOME, the part under or on the ground from which the frond springs, or root commonly so called, to which the fibres or real roots are attached; the caudex.

RHOMBOIDAL, diamond-shaped, only rather broader one way than the other.

ROOT, the main mass at the bottom of the plant whereout it grows, including the fibres.

SECUND, pointing one way.

SEGMENT, divided portion of the leaf; or the leaf itself when joined to its neighbour by their bases; lobe.

SERRATE, toothed like a saw.

SERRATURES, saw-like indentations.

SESSILE, tapering off without any distinct leaf-stalk, and merging presently in the stem.

SILICEOUS, composed of a flint-like substance.

SIMPLE, single; plain; uncompounded.

SINUATE, }
SINUOUS, } bending; crooked; serpentine.

SINUS, the inner end of an indentation.

SORIFEROUS, bearing the sori.

SORUS, an aggregated mass of thecæ or spore-cases.

SPINULOSE, spinous; bristly.

SPORES, organs resembling buds or seeds in the lower plants.

STAMEN, pollen-bearing organs in the interior of a flower or blossom.

STIGMA, the point of the pistil or style in the interior of a flower or blossom, receiving the pollen.

STIPES, the stem or stalk of the frond.

STOMATES, the respiratory pores or openings in the epidermis.

STRIATED, scored or furrowed.

SUB -prefixed, acts as a diminutive ; incompletely, in a modified degree.

SUCCULENT, soft ; sappy ; pulpy.

TERETE, square.

TERMINAL, springing from the end of an organ.

TERNATE, three-branched or leaved at the same point.

THECA, spore-case or vessel.

TOMENTOSE, cottony.

TORTUOUS, twisting ; winding ; crooked.

TRAPEZIFORM, having four unequal sides.

TRIDENTATE, triply-toothed.

TRIFID, cleft into three.

TRIPINNATE, having secondary branches themselves pinnate, or bearing on them lateral offshoots divided down to the stem.

TRUNCATE, lopped off abruptly.

TUFTED, clustered ; growing in bunches or swellings.

UMBELLIFEROUS, where a number of stalks springing from one centre produce a round of flowerets above, umbrella-fashion.

UNILATERAL, growing all on one side only.

URCEOLATE, pitcher or vase-shaped.

VASCULAR, consisting, or full of vessels.

VEINS, the fibres, nerves, or ribs of a leaf.

VENATION, mode of disposition or arrangement of the veins or nerves.

VENULES, smaller veins or fibres.

VERNATION, mode of growth of the young undeveloped frond.

WINGED, having a thinner, slighter border, running down the side.

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